

DOCUMENT RESUME

ED 222 389

SE 039 494

AUTHOR LaHart, David, Ed.
 TITLE Sunny Side Up in Language Arts.
 INSTITUTION Seminole County Board of Public Instruction, Sanford, Fla.
 SPONS AGENCY Florida State Dept. of Education, Tallahassee. Office of Environment Education.
 PUB DATE Sep 81
 NOTE 139p.; For related documents, see SE 039 493-496.
 EDRS PRICE MF01/PC06 Plus Postage.
 DESCRIPTORS Conservation Education; Elementary School Science; Elementary Secondary Education; *Energy; Energy Conservation; *Interdisciplinary Approach; *Language Arts; *Language Skills; *Learning Activities; Middle Schools; Science Education; Secondary School Science; *Solar Radiation
 IDENTIFIERS *Energy Education; Florida

ABSTRACT

This Sunny Side Up activities book is a coupling of science and language arts materials that will assist middle school teachers in developing energy awareness while they are teaching language arts skills. The majority of exercises and activities are keyed to the basic reading and writing skills stated in the "Minimum Performance Standards for Florida Schools"; however, an enrichment section offers higher level skills. The activities (presented in four units) are designed to supplement regular language arts classroom materials and can be used with the teacher's current units as reinforcement or as review materials. Activities are designed to develop vocabulary skills (unit 1), reading skills (unit 2), and writing skills (unit 3). Enrichment activities are provided in unit 4. (JN)

 * Reproductions supplied by EDRS are the best that can be made *
 * from the original document. *

FD222389

SE039494

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

✓ This document has been reproduced as
received from the person or organization
originating it.
☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

James M.

Phillips

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

SUNNY SIDE UP IN LANGUAGE ARTS

**Bettie Palmer
Project Director
Seminole County Schools**

**David LaHart
Editor
Florida Solar Energy Center**

**Illustration by:
Carol Gentry
Lake View Middle School**

**Sunny Side Up was partially supported by a
Environmental Education Mini-grant from the
Florida Department of Education**

THE SCHOOL BOARD OF SEMINOLE COUNTY, FLORIDA

Robert W. Hughes, Superintendent

T. D. Dagg, Assistant Superintendent for Instruction

Andrew J. Bracken, Director of Secondary Education

BOARD MEMBERS

William J. Kroll, Chairman

Roland V. Williams, Vice-Chairman

Allan F. Keeth

Pat Telson

Nancy Warren

WRITING TEAM

Kathy Coughlin	Science	Jackson Heights Middle School
Fran Durrenberger	Language Arts	Milwee Middle School
Maria Gerrity	Mathematics	Rock Lake Middle School
Marilyn Hornquist	Mathematics	Tuskawilla Middle School
Cynthia Miller	Language Arts	South Seminole Middle School
Joan Mitchell	Language Arts	Jackson Heights Middle School
Pat Murphy	Mathematics	Sanford Middle School
Shirley Pfleuger	Science	Teague Middle School
John Rafferty	Social Studies	Lakeview Middle School
Jean Rumsey	Social Studies	Jackson Heights Middle School
Ed Ware	Social Studies	Rock Lake Middle School
Polly Wilson	Science	Jackson Heights Middle School
William A. Moore		Environmental Studies Center

ACKNOWLEDGEMENTS

Many people are responsible for Sunny Side Up. Seminole County teachers worked long and hard to produce the curriculum in Language Arts, Mathematics, Science, and Social Studies. Carol Gentry provided the abundance of excellent illustrations and Eileen Dunn supervised typing and retyping the manuscripts. But there are many others who helped. Dick Tillis and Jim Phillips from Florida's Office of Environmental Education provided the funding and made many valuable suggestions during the project. Rosalyn Tillis generously supplied an abundance of publications from the Governor's Energy Office.

We borrowed ideas, activities and even some illustrations from other energy education materials including:

Solar Energy Project developed for the U.S. Department of Energy by the New York State Education Department, Bureau of Science Education;

Solar Energy I and II from the American Museum of Science and Energy, Oak Ridge Associated Universities;

Energy and My Environment by Matt Brennan, published by the Florida's Governor's Energy Office, and:

Solar '80's by David LaHart which is published by the Florida Solar Energy Center. Copyrighted material was included only when proper permission could be obtained.

Sunny Side Up is symbolized by Solar Sunny, an all knowing critter who has not lost the common touch. Notice the bad tennis shoes! Professor, hard hat, adventurer or politician, Sunny is always helping us along the path to energy knowledge. We hope you enjoy Sunny while you are learning about energy.

David E. LaHart
Florida Solar Energy Center
Cape Canaveral, Florida

TABLE OF CONTENTS

INTRODUCTION.....	i
UNIT I	
BUILDING VOCABULARY SKILLS.....	1 - 11
Minimal Science Vocabulary.....	1
Activity 1 - Definitions.....	2
Activity 2 - Solar Crossword.....	3
Activity 3 - Solar Energy Puzzle.....	4
Activity 4 - Solar Heat.....	5
Activity 5 - Discovering The Sun.....	6
Activity 6 - Solar Energy Word Find.....	7
Activity 7 - Jumbles.....	8
Activity 8 - Solar Energy Quiz.....	9
Activity 9 - A Solar Perspective.....	10
Activity 10 - Energy Crossword Puzzle.....	11
UNIT II	
BUILDING READING SKILLS.....	12 - 46
Context Clues.....	12
Inflection: Adjectives and Adverbs.....	15
Word Parts.....	17
Stated Main Idea.....	19
Inferred Meanings.....	23
Who, What, Where, When, Why.....	24
Who, What, Where, When, Why, And How.....	27
Order of Details.....	28
Details.....	29
Cause And Effect.....	32
Fact And Opinion.....	34
Following Written Directions.....	37
Sources Of Information.....	39
Sun Search.....	40
Library Resource Data Sheet.....	42
Research Suggestions.....	43
Table Of Contents.....	44
Index Use.....	45
Index.....	46
UNIT III	
BUILDING WRITING SKILLS.....	47 - 79
Noun Plurals.....	47
Regular Verbs.....	49
Auxiliary Verbs.....	52
Prepositional Phrases.....	53
Adjectives.....	54
Subjects & Verbs.....	55
Sentence Patterns.....	56
Compound Subjects Or Verbs.....	57
Subject And Verb Agreement.....	59
Compound Sentences.....	61
Sentence Combining.....	62
Writing A Letter.....	66

UNIT III

BUILDING WRITING SKILLS.....	47 - 79
Energy Information Sources.....	67
Spelling.....	69
Using Legible Cursive Handwriting.....	71
Alphabet Chart.....	72
Punctuation.....	74
Contractions.....	75
Comma In Direct Address.....	76
Capitalization.....	77

UNIT IV

ENRICHMENT.....	80 -109
Literature/Mythology.....	80
Literature/Fables.....	92
Literature/Mythology/Poetry.....	94
Energy Poems.....	98
Energy Paragraphs.....	99
Energy Activities With Art.....	100
Newspaper Energy.....	101
More Energy Activities.....	102
Advertising And Energy.....	104
Advertising & Propaganda Techniques.....	108



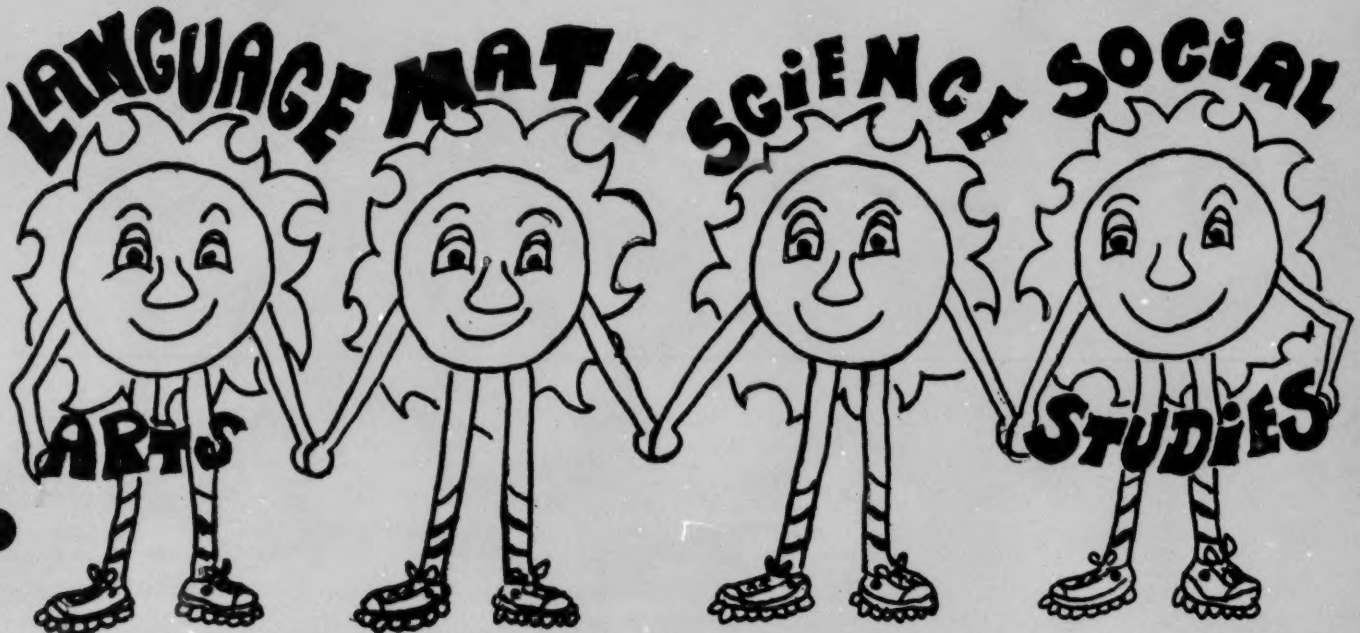
READING, WRITING, AND VOCABULARY

INTRODUCTION

This Sunny Side Up activities book is a coupling of science and language arts materials that will assist middle school teachers in developing energy awareness while they are teaching language arts skills. The majority of exercises and activities are keyed to the basic reading and writing skills stated in the "Minimum Performance Standards for Florida Schools;" however, the enrichment section offers higher level skills.

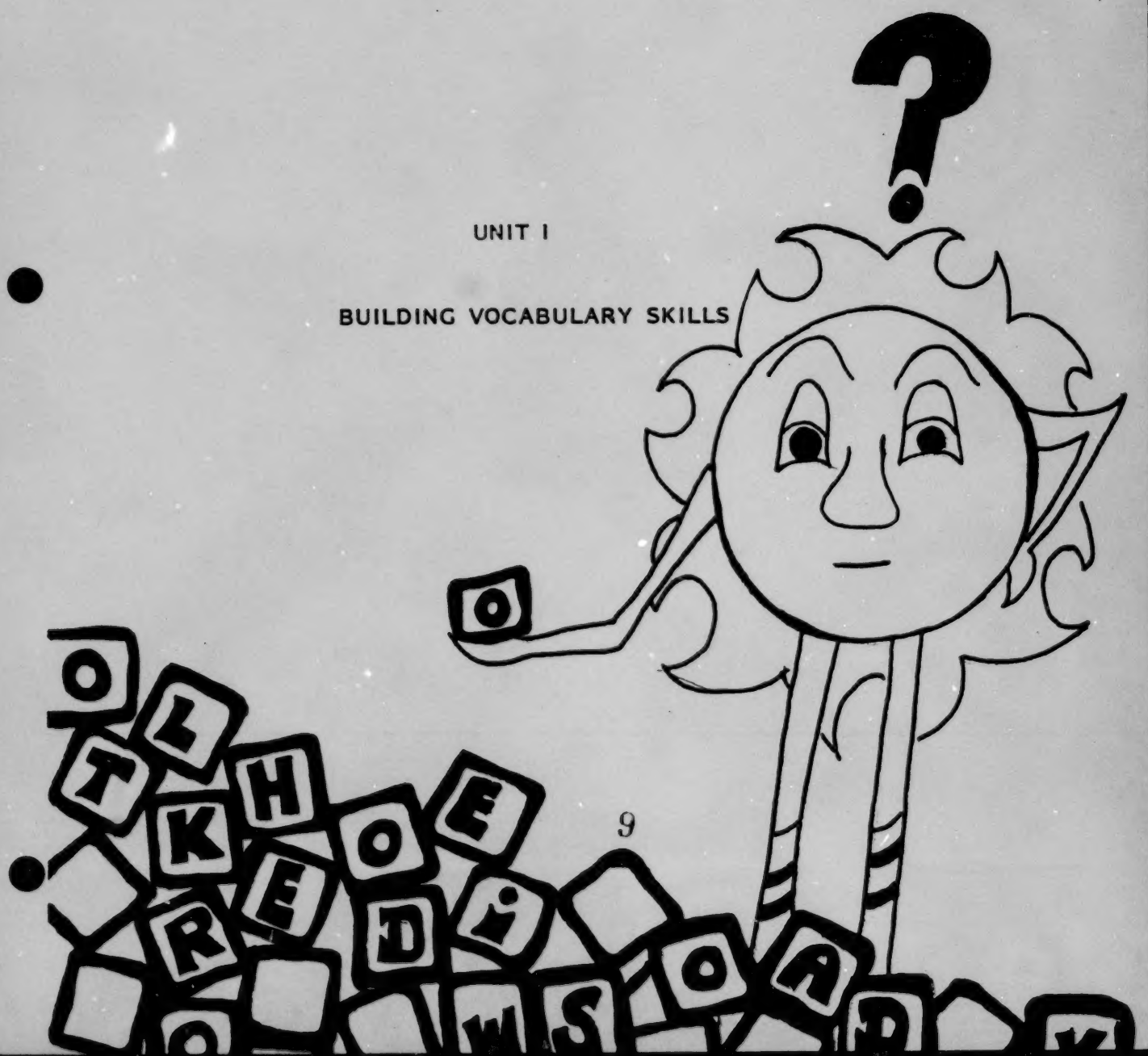
These activities are designed to supplement regular language arts classroom materials. They can be pulled in any order and used with the teacher's current units as reinforcement or as review materials. They may be duplicated for classroom use.

You may wish to coordinate these activities with science, social studies, and mathematics teachers. Sunny Side Up books have been developed for all four academic disciplines so a team approach to energy education is possible.



UNIT 1

BUILDING VOCABULARY SKILLS



WORDS WE NEED TO KNOW
MINIMAL SCIENCE VOCABULARY

Florida's Student Assessment Minimal List for Science
Grade 8 (Developmental Level: Grade 4 & 5)

absorbed
adapted
agent
alcohol
altitude
aluminum
ancestors
ancient
ashes
astronaut
atmosphere

bacteria
balance
bamboo
bare
battery
behavior
bitter
bloom
brain
brass
breathe
brilliant
broad

cabbage
cactus
camel
cane
capture
cell
century
chamber
channel
chart
chemical
choice
claws
clay
climate
clover
collect
colony
community
compare
condition
connect
construct
continent
control
coral

cotton
creature
crop
crude
crust
crystal
current

dense
describe
detail
dew
dinosaur
disease
echo
effect
elective
equal
equipment
evidence
examine
exchange
experiment
explore

female
fertile
fever
fist
flesh
flock
flood
fraction
frost
fuel
future

gasoline
generation
glaciers
globe
gum

health
height
horizon
hurricane

instructions
instrument
intelligent
intervals
invent

language
lava
leather
length
level
lever
lid
lip
liquid
lungs

magnet
male
maple
mass
material
measure
medicine
member
memory
mineral
mold
mosquitoes
moss
motion
multiply
murmur
muscle
museum

native
nature
nerve
noon
nurse

observe
odd
operate
orbit
oxygen

pain
palm
parallel
parrot
pattern
peach
peak
petroleum
phone
physical
pigeons

pit
planet
poison
polar
population
position
principle
problem
proof
pupil
pure
purpose
quality

range
rat
raw
ray
reflect
region
regular
report
rhythm
rocket

sample
satellite
scale
scheme
science
score
section
select
self
separate
series
shoulder
sight
soda
solid
solve
speech
stable
stomach
strain
strength
stroke
subject
sugar
surface
surround

sweat
symbol
system
tear
telegraph
telescope
temperature
theory
thumb
thunder
tide
tiger
tin
toad
toe
tongue
total
trace
tropical
type
unit
universe

vacuum
vessel
visible
vision
volcano

web
wrist



ACTIVITY 1

DEFINITIONS

Directions: Define the word underlined in each sentence. Use a dictionary to be sure you have the correct definition.

1. Solar water heaters use heat absorbed from the sun to raise the water's temperature.
2. Some materials reflect light.
3. Aluminum is often used in solar reflectors.
4. A solar heater can replace a coal furnace.
5. Solar cells or photovoltaic cells produce electricity that can be stored in a battery as chemical energy.
6. The sun is a source of non-polluting fuel.
7. Petroleum is used to make gasoline.
8. Scientists are studying the uses of solar energy to replace fossil fuels.
9. Sugarcane is a sub-tropical plant that can be used to make alcohol.
10. Equipment to collect solar energy can be made from common materials.
11. Florida's climate is carefully measured with instruments that describe physical details.

DEFINITIONS:

Solar Sunny :



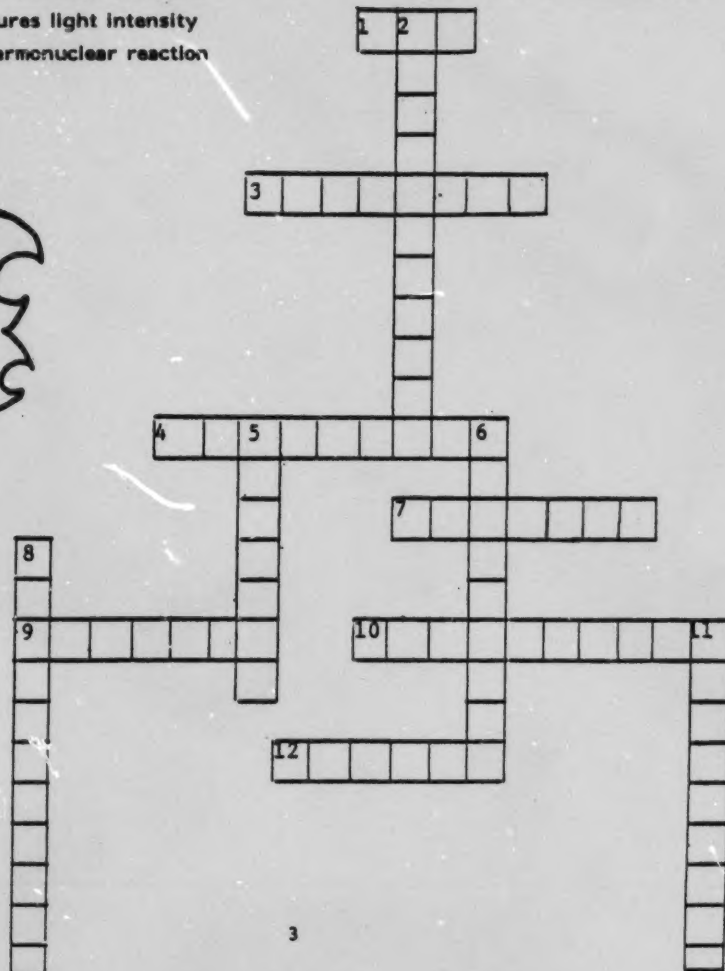
ACTIVITY 2
SOLAR CROSSWORD

ACROSS

1. Our ultimate energy source
3. Heat radiation
4. Used for solar heating
7. An element in solar cells
9. Casts the moon's shadow
10. Measures light intensity
12. A thermonuclear reaction

DOWN

2. Shielded out by the earth's ozone layer
5. 1 cal/cm^2
6. Energy from the sun
8. Measures temperature
11. Used in a solar concentrator



ACTIVITY 3 SOLAR ENERGY PUZZLE

T H K L E N E R G Y A C Z S Q U L W X E K G T H L
 L M S Q S M G P A L I M E X K I M J B D F I L O L
 R W X U P Z L R K E T S R S T R A T O S P H E R E
 S M O P I Q U H E L E O E R C M Z Q U B D X L K C
 S I T Z L B F E G E X K H O P K D H V O I F G U C
 S B E C C M O A M Q N M P L E R B R F T L G M W I
 T X U K E A P T H T P H S C W X O O L S D M E C A
 O H P O L U L T R A V I O L E T M T P R S O L D T
 P B E G P W H R M R N U P U O A Z C C O B L O F L
 S R V R P B I A C V S G O X S R V E P E M W K V O
 N F L N M S H N V C R A R E C E S D X N L A M N V
 U V R C Z O A S D M K D T M A B G N U D J L O C O
 S T J L S G M F H M A O F T L N K O T L F I O K T
 A R G Y O M Q E E N I I J S D U O L C U T E E E E O
 M O S H M O E R T U D L U P Q R S G S A E P D M H
 B A I F H Q G K L E M F L Y W H E E L H R I N Q P
 R P S M X B N O U P R V M Z K C P O R Y G P E K P
 L V E H J S A I T S S P I Q R T S L F R P R T G A
 Z F H O V A H M X Y O A O S S N M O L S E E O M O
 O A T W T R C S P O L L U T I O N L E H Y P O E R
 D R N M A M X D L P A J A I U B F U P V G P B P E
 K S Y Z S E E V E R R S E R J W L S X U J O T G F
 O U S P E C T R U M E N F K I U O E G M G C A W L
 A G O H A X A M D I N Z L H K M Y N L S M T C O E
 P L T E M P E V L F E U B C T L E T Z I H K K S C
 G X O D K O H P U Y R W M A Q T J T R K G M B M T
 F E H U F H T M T K G D H M E N K S E C Z H N T O
 T D P R L U H K B W Y N O I T A I D A R A M T O R



1. ENERGY
2. ECLIPSE
3. PHOTOVOLTAIC CELL
4. STRASTOSPHERE
5. GREENHOUSE
6. SUNSPOTS
7. THERMOMETER
8. WINDMILL
9. ULTRAVIOLET

10. HEAT TRANSFER
11. TROPOSPHERE
12. CLOUD
13. INSULATION
14. FLYWHEEL
15. HEAT EXCHANGE
16. PHOTOSYNTHESIS
17. SPECTRUM
18. POLLUTION

19. SOLARIMETER
20. VISIBLE LIGHT
21. ATMOSPHERE
22. REFLECTOR
23. COPPER PIPE
24. BTU
25. RADIATION
26. SOLAR ENERGY

ACTIVITY 4

SOLAR HEAT

R A E L C U N A T Y S U N I B U S T P Q V A Y X
 W O V N E O C G H T L K C C L Y T N D K L T A B
 C V N W N D L J Y O I U A T A E H M P X I H C I
 L D E I O X J R S X O L C I C P W E U C L E A T
 Z T C E L L O C N H O O O T K I T L I O O R I S
 E A R S T F K Y C R L P C D F Y A R C O Q M B Y
 F G C L O Y Z P I C A L H T S R T H Y O L A R B
 E G K A F S A M M Y Y T E R Q C C H Y X Q L L R
 I C M E A L E I S A G P R U E S A M N U Y S T O
 P E A R T T S O C K M R S L S T U M O T I Q S S
 M A T N E S O U R C E P E I W H I T I R U A S B
 I O R R A B D E K L M A N N K E I M S B B I D A
 Z O P S E S K L U Y C M N S E P Q L U I C X Q Y
 K A B K O V W E R E Q U C U L E M R F Q E E R S
 O S X Y M D N L M N Q O E L S A N D C T E Y F A
 T V X Y R A M O G E N E R A T E I R E W O P B S
 S C O A L H T I C R Q C L T I N W U R T I M L B
 E T L H U N E R E G F I T I I W A Q B S T R O U
 S O R E L M T R P Y M U B O A S M W U I A E T B
 S W C B N V T P O O W S V N K L G H T E U I S H

SOLAR
 INSULATION
 ENERGY
 ABSORB
 BLACK
 STYROFOAM
 COLLECT

CALORIMETER
 GENERATE
 POWER
 GAS
 ELECTRICITY
 OIL
 SUN
 HEAT

COAL
 SOURCE
 FUSION
 CONVERT
 BURN
 NUCLEAR
 THERMAL

ACTIVITY 5

DISCOVERING THE SUN

ULTRAVIOLET
VISIBLE
LIGHT
HEAT
COPPER

TRANSFER
CLOUDS
SUNSPOTS
SOLAR
ENERGY

SPECTRUM
REFLECTOR
SOLARIMETER
PIPE
TROPOSPHERE

POLLUTION
ENERGY
COLLECTOR
RADIATION
INSULATION

S P E C T R U M F C N T
P G T H G I L F E O S R
Y S U T M L T N I L O O
Z Z U E Z X R T S L L P
H F S N C T A B C E A O
H D S F S L V I G C R S
H L A M O P I D M T I P
E S D S O C O P L O M H
A N N T P L L T S R E E
T I E J U O E F S E T R
T P O L L U T I O N E E
R S U E X D Y F L E R P
A M Y L P S S S A R A I
N H V M A R R W R G D P
S R V I S I B L E Y I R
F P R N Q S T M N N A E
E O D O N N E L E E T P
R E F L E C T O R E I P
C O V I L L H A G U O O
F D R E L L A L Y Q N C



How many other words can you find?

ACTIVITY 6

SOLAR ENERGY WORD FIND

LTDSISTARSKYANDHUTCHT
AAOXFPAIDFPASSAASILAO
NNTPYANNJEYOUERBETONW
GGTELGCIARZFANINAUAN
LIERNEKECRHEATRRONTEN
EARTH TIRKHEATHINTTPSO
YAROVHEARLACEUTZHULK
KORNVAOEQRIUNTRTAUTER
NSCIENMYAAOGNRNSCNTTR
EOASATEKOTMCIIEOEGEAT
BEICANESRZEEKNRLQUMOM
SATTKDPRMOTOMESOFSPA
SERAAEUASIEASRTWOHESN
CRSRAITTBRETEMONARYP
IURKDRDSYHUTCHSAZYARD
ETFWIAEADABATTPAYSTRI
NAOZACRARRASEUYRYEUON
CRNOTKSRNBSINHPOWEROT
EEROIUITBOSSINANARES
NPYROMETERIETTISUAIR
AMEANEREGLEXMETRICSZRE
MEETERINNEREHITAIEQIE
ETHERMOMETERERTEAEAND

LANGLEY

LATENT HEAT

OUTPUT TEMPERATURE

PHASE

POWER

PYRANOMETER

PYRHELIOMETER

PYROMETER

RADIATION

TEMPERATURE

THERMOMETER

WATT

ACTIVITY 7

JUMBLES

Directions: Unscramble the letters below into a word. The letters circled will give the answer to the statement below when unscrambled.

R O A L S

B I T G N U

P I C S L E E

M E C T R U P S

G E N R E Y

BATHERS' BOTHER

P U S T O S N

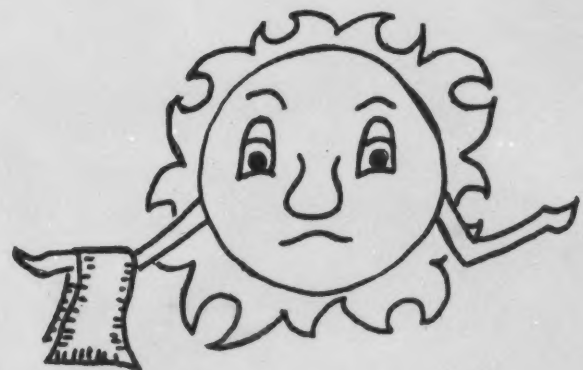
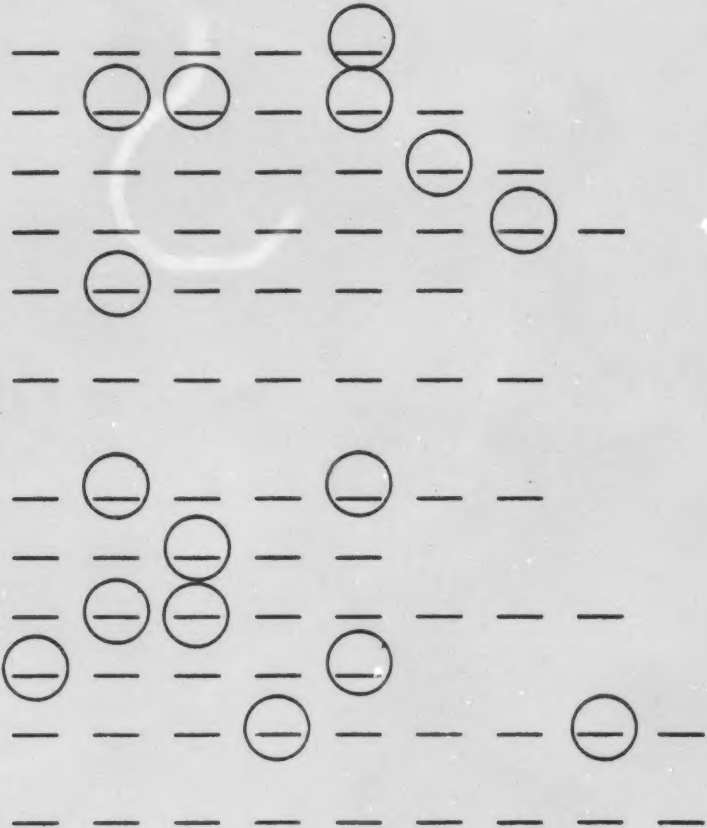
D U C O L

L M I N D I N L

G H T I L

L O C E R C T O L

ASTHMATICS' AGGRAVATION



ACTIVITY 8
SOLAR ENERGY QUIZ

Directions: Match Column A with the underlined scrambled words in Column B. Write a definition for each word.

COLUMN A

COLUMN B

- | | |
|-------------------------|----------------------------|
| 1. Pyranometer | _____ mpeeeurttra |
| 2. Albedo | _____ tsrobainop |
| 3. Langley | _____ deabol |
| 4. Collector Box | _____ leroctocl oxb |
| 5. Incident Angle | _____ emrhtoemetr |
| 6. Temperature | _____ gylalne |
| 7. Pyrheliometer | _____ idintcne nagel |
| 8. Collector efficiency | _____ fiencifeyc ellooctrc |
| 9. Thermometer | _____ retnyrapome |
| 10. Absorption | _____ prhetoilermey |

ACTIVITY 9

A SOLAR PERSPECTIVE

Directions: Select the words from the list below that best completes the sentences and read the vertical message.

greenhouse
photovoltaic
radiation
convection
stratosphere

spectrum
windmill
reflect
sunspots
infrared

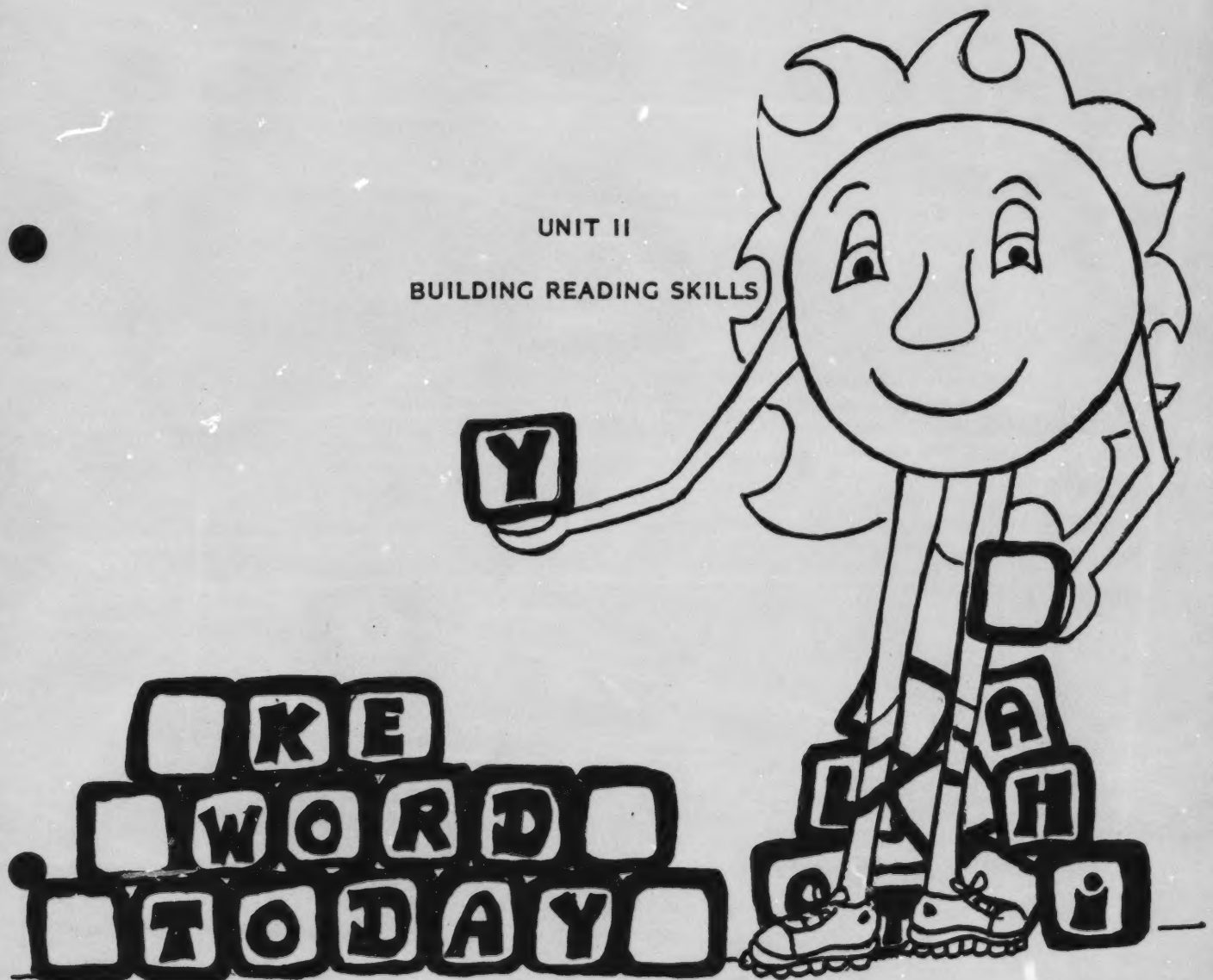
photosynthesis
eclipse
thermometer
visible
energy

copper

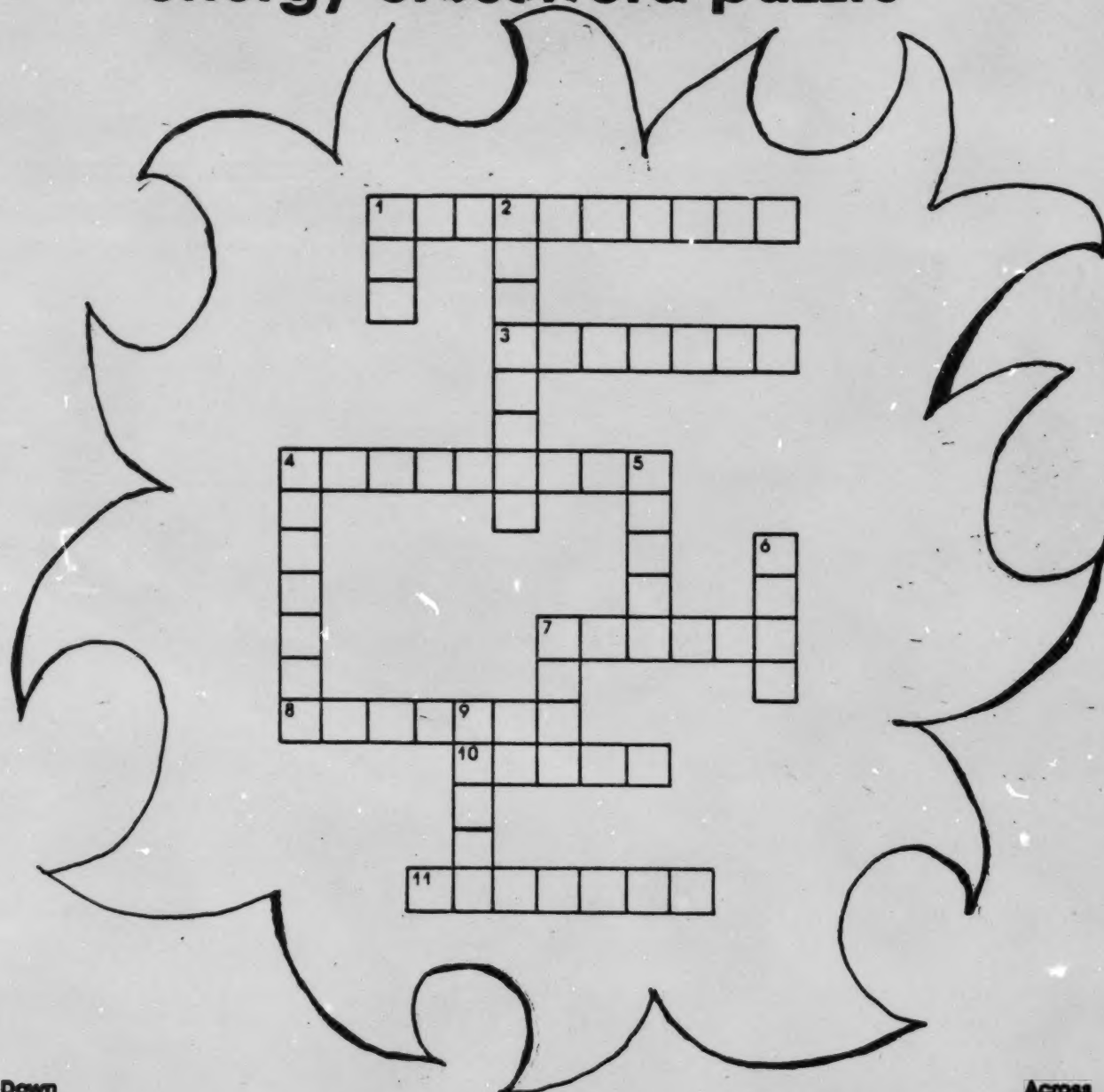
1. When the moon comes between the earth and the sun, an _____ occurs.
2. Shiny articles _____ the sun's rays.
3. The middle layer of the atmosphere is the _____.
4. Radiators heat rooms by _____.
5. Solar cells are also called _____ cells.
6. Light can be broken down and observed as a _____.
7. Light we can see is called _____.
8. TV interference is often caused by _____.
9. Florists have used this solar collector for years.
10. Green plants use the sun for _____.
11. An instrument used to measure temperature is a _____.
12. Found in Holland, a _____ uses a form of the sun's energy.
13. The ability to do work is called _____.
14. _____ is used as piping in solar collectors.
15. The sun's rays come to earth as _____.
16. Light waves sometimes used in cooking are called _____.

The hidden message is _____

UNIT II
BUILDING READING SKILLS



energy crossword puzzle



Down

1. One fuel source which is becoming less available is natural _____.
2. Today, windmills are called wind _____.
4. Florida is one of the _____ states.
5. Solar _____ have operated space vehicles in recent years.
6. Part of our life support system.
7. Some say using wind for energy production is a good idea because it's _____.
9. Energy that relates to the sun.

Across

1. The method of producing electricity from the ground.
3. Plants and trees are sometimes called this.
4. Materials like a rubber ball and rubber bands, and fuels such as oil shale, and tar sands, are _____, or man-made.
7. The process of slamming hydrogen atoms together at amazing speeds to produce heat which is used to make electricity.
8. Help keep our environment cool.
10. A source of electricity where the force of waves and tides and temperature layers do the work.
11. The device that processes nuclear fuel, or uranium, to make more fuel for generating electricity.

Across: geothermal; biomass; synthetic; fusion; trees; ocean; breeder

Down: gas; turbines; sunbelt; free; cells; land; solar

CONTEXT CLUES

(Examples, Explanations, Synonyms, Comparison/Contrast)

Directions: Using the following paragraphs:

- 1) Define the words listed below.
- 2) Underline the words or phases in the paragraphs that help tell you what the words mean.

- | | |
|-----------------------------|-------------------------|
| 1. thermal energy | 10. sun spaces |
| 2. active system | 11. roof ponds |
| 3. passive system | 12. convective loop |
| 4. heavy building materials | 13. circulate |
| 5. direct gain systems | 14. thermosiphon system |
| 6. radiant energy | 15. absorber plate |
| 7. thermal drapes | 16. reradiation |
| 8. thermal storage walls | 17. absorption chillers |
| 9. indirect gain | |

SOLAR HEATING AND COOLING

Solar heating and cooling are areas where applied solar technology is making an impact on energy use. This is especially true of solar water and space heating. Two distinct but complementary styles are used to convert sunlight to thermal energy: (1) Active systems generally use mechanical power like pumps or fans to collect, store, and distribute energy; (2) Passive systems do not use mechanical pumps. These use natural energy flows produced by conduction, convection, and radiation to store and transport thermal energy within a structure. Designs frequently combine both types of systems, resulting in a hybrid system.

Passive systems are generally part of the overall design of a structure and can be the most cost-effective, natural way to provide part of your heating and cooling needs. Passive systems are usually characterized by the abundant use of heavy building materials such as concrete, brick, and water. The approaches to passive design fit five basic groups:

1. **Direct Gain Systems:** Such systems incorporate south-facing windows (often called solar windows) to admit sunlight into the living space. When the sunlight strikes interior surfaces of the building it changes from shortwave light energy to longwave heat (radiant) energy. This radiant energy, which does not readily pass through glass, is "trapped" in the building's walls, floors, and ceilings (thermal mass) and is available for use later (at night) when heat is needed to maintain comfort. Excessive heat gains during the day, and losses at night or on cloudy days, are often controlled by movable insulation or "thermal drapes."
2. **Thermal Storage Wall:** Thermal storage walls operate on the same principles as do direct gain systems except that the massive storage material is placed between the solar windows and the living space. Thus, sunlight does not enter the living space of the building directly; instead, heat energy enters the living space by traveling through the thermal storage wall. For this reason, thermal storage walls sometimes are called "indirect gain" systems.
3. **Sun Spaces:** Sun spaces are similar to the thermal storage wall, the major difference being that the distance between the solar windows and the storage wall is increased to allow the space between to be usable either as a greenhouse, atrium, entry foyer, sun room, or simply as a buffer zone. When used as a greenhouse, the sun space can provide valuable humidity, oxygen, food, and plants to the home occupants.
4. **Roof Ponds:** A roof pond also resembles a thermal storage wall. The storage medium, however, is horizontal (in the roof) rather than vertical and is liquid rather than solid. Water is stored in containers and is warmed by the sun during sunny periods and insulated at night and on cloudy days with movable roof insulation. For cooling, the pond is used in reverse, with the insulation being used during sunny periods and removed during cool night periods.

5. **Convective Loop:** The convective loop is based on the natural thermodynamic tendencies of fluids (either liquid or gas). When a fluid is heated it tends to rise, leaving behind a space or low-pressure zone, and other cooler fluids rush in to fill that space. Thus, if a container of fluid (a house filled with air or a drum filled with water) is heated on one side only (solar windows occur only on the south side of a building), the fluid will tend to circulate.

The heat which is generated at one area of the container is transferred to another area (usually the highest point in the container). In solar heating, this principle is what is commonly called the thermosiphon system,

where a storage medium is located higher than the collector or solar window, allow natural convection to move and transfer the thermal energy from the collector to the storage medium.

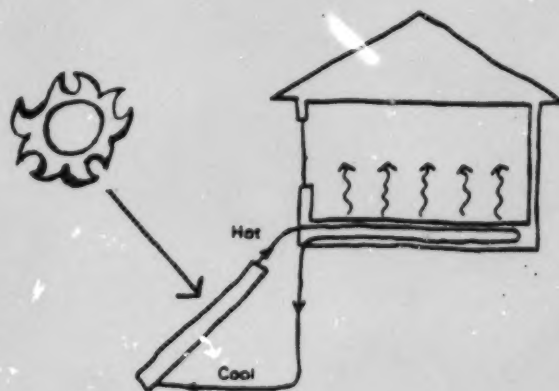


Active solar systems generally use a collector with an absorber plate that transfers the sun's heat to a working fluid (either liquid or air) and a translucent cover plate that prevents reradiation of heat to the environment.

Insulation at the back of the collector also reduces energy losses. Storage is required if

the thermal energy collected during sunlight hours is to be used at night and when the sky is overcast.

Water is usually used as the storage medium for liquid systems and rock beds store heat for air systems. Cooling is handled by absorption chillers similar to those in gas refrigerators.



INFLECTION: ADJECTIVES AND ADVERBS

- Comparatives:** The comparative degree is used when two things are being compared. The word more or er ending is added.
- Examples:** A. The Brown's electric meter runs faster than mine.
B. She becomes more energy-wise each year.
- Superlative:** The superlative degree is used when three or more things are being compared. The word most or the est ending is added.
- Examples:** A. The sun is the longest lasting and cleanest source of energy known.
B. Coal is the most abundant of our fossil fuels.

ACTIVITY 1

Directions: Read the sentence and choose the answer which means the same as the underlined word(s).

- _____ 1. Solar water heating is cheaper than electrical water heating.
- A. Solar costs less than electrical heating.
B. Solar costs more than electrical heating.
C. Solar and electrical are the same.
D. Solar is the only method to use.
- _____ 2. Some people feel that photovoltaic or solar cells are more attractive than some other methods because they generate electricity directly from the sun without any moving parts or noise.
- A. Photovoltaic cells are the best.
B. Solar cells are the worst.
C. Photovoltaic cells are better than some methods.
D. Photovoltaic (solar cells) are the only method of using solar energy.
- _____ 3. The manufacturing of solar equipment is a newer industry than the automobile industry.
- A. They are the same.
B. The solar industry is the only industry.
C. The solar industry came later than the automobile industry.
D. The automobile industry came later than the solar industry.

- _____ 4. The industrial sector is the largest user of energy in the United States.
- A. Industry uses the most energy.
 - B. Industry uses the smallest amount of energy.
 - C. Industry uses no energy.
 - D. Industry uses the same amount as other sectors of the United States.
- _____ 5. Some people say that we can avoid energy problems by going back to a simpler and more natural way of life.
- A. A way of life that doesn't use as much energy.
 - B. A way of life that uses all of the energy sources quickly.
 - C. A way of life that ignores the energy crisis because it's too much trouble to solve.
 - D. A way of life that includes giving up all medical care because X-ray equipment requires a great deal of electricity.

ACTIVITY 2

Directions: Choose the letter for the word that correctly completes each sentence.

- _____ 1. My solar heating system is the _____ one in the state.
- A. most efficient
 - B. more efficient
 - C. efficientest
- _____ 2. The sun transmits _____ to the earth's surface than all of the energy stored in the earth's known reserves of coal, oil, and natural gas.
- A. more energy
 - B. most energy
 - C. less energy
- _____ 3. The Beeline Expressway is the _____ of the two routes to the Solar Energy Center in Cape Canaveral.
- A. shorter
 - B. shortest
 - C. more shorter
- _____ 4. R-29 insulation is _____ than R-19 insulation.
- A. goodest
 - B. better
 - C. best
- _____ 5. Black, dull surfaces absorb the sun's rays _____ than white ones.
- A. most quickly
 - B. more quickly
 - C. quickest

WORD PARTS

Prefixes, Suffixes, and Root Words

A root word is the basic part of a word that carries the meaning of the word. Example: vert = change, moveup.

Suffixes can be added to root words to make different parts of speech. Example: vert + ical = vertical (adj.) upward.

Prefixes can be added to root words to change their meaning slightly. Example: in + vert = invert (verb) turn; change around.

Root words can be combined to form another word. Example: bio (life) + ology (study of) = biology (study of life)

ACTIVITY 1

Directions: Look up the following energy related root words in the dictionary. Write the definition for each root.

- | | |
|---------------|------------------------|
| 1. bio | 16. sol |
| 2. mass | 17. electr, or electro |
| 3. atom | 18. act |
| 4. oxy or oxi | 19. pass |
| 5. vert | 20. gas |
| 6. cyclo | 21. linear |
| 7. hydro | 22. watt |
| 8. therm | 23. port |
| 9. geo | 24. energy |
| 10. gen | 25. syn |
| 11. kilo | 26. nucleus |
| 12. mega | 27. neg |
| 13. ology | 28. pose |
| 14. petro | 29. magnet |
| 15. photo | 30. duct |

ACTIVITY 2

Directions: Define each prefix in the list below. A dictionary may be used if necessary.

- | | | |
|---------|-----------|------------|
| 1. mis- | 10. in- | 19. inter- |
| 2. re- | 11. non- | 20. intra- |
| 3. un- | 12. pre- | 21. mal- |
| 4. ad- | 13. pro- | 22. multi- |
| 5. com- | 14. ante- | 23. semi- |
| 6. con- | 15. anti- | 24. sub- |
| 7. de- | 16. auto- | 25. super- |
| 8. dis- | 17. en- | 26. trans- |
| 9. im- | 18. ex- | |

ACTIVITY 3

Directions: Combine the prefixes in Activity 2 with the root words in Activity 1 to make as many words as possible.

ACTIVITY 4

Directions: Define each suffix below. Combine each suffix with a root word. Use as many roots from Activity 1 as possible. Then write a definition for each new word. See the examples below.

Example: a. -er = noun - one who does something
farm + er = one who operates a farm

b. -ic = adjective - of; having the nature of
atom + ic = having to do with atoms or nuclear power

- | | | | |
|----------|------------|-----------|-----------|
| 1. -er | 10. -an | 18. -ish | 26. -ance |
| 2. -ful | 11. -ar | 19. -ist | 27. -ant |
| 3. -ly | 12. -ation | 20. -ment | 28. -ate |
| 4. -ness | 13. -en | 21. -or | 29. -ence |
| 5. -teen | 14. -hood | 22. -ous | 30. -ent |
| 6. -y | 15. -ible | 23. -sion | 31. -ity |
| 7. -able | 16. -ic | 24. -th | 32. -ive |
| 8. -able | 17. -ion | 25. -tion | 33. -ize |
| 9. -age | | | |

ACTIVITY 5

Directions: Add prefixes from Activity 2 to roots and suffixes to form words.

ACTIVITY 6

Directions: List as many words as possible made from the root words sun or sol. Use a dictionary to help.

Examples: solar
sunshine
sunrise
sunset
solarium

ACTIVITY 7

Directions: Break the following energy-related words into roots and suffixes. What does each root mean? What does each suffix mean?

Example: geo - earth therm - heat al - of or having to do with

- | | |
|------------------|-------------------|
| a. geothermal | j. hydroelectric |
| b. biomass | k. horsepower |
| c. solarium | l. hydrothermal |
| d. gasohol | m. kilowatt |
| e. photovoltaic | n. photoelectric |
| f. megawatt | o. photosynthesis |
| g. synfuels | p. thermodynamics |
| h. quadrillion | q. thermostat |
| i. bioconversion | |

STATED MAIN IDEA

All reading is made up of words that express ideas. People write by telling:

1. Their main ideas and,
2. Details (little ideas or facts which support the main idea).

To find the main idea in a paragraph, answer this question as you read:

What is this paragraph about?

If you answer this question correctly, you know the main idea. A good writer puts only one main idea into each paragraph. Another name for the main idea is a topic sentence. You will find main ideas in three (3) different places in a paragraph.

FIRST SENTENCE MAIN IDEAS

The writer tells you the big idea first and then writes details which explain the ideas.

LAST SENTENCE MAIN IDEAS

The writer gives you several details which lead up to a main idea sentence which summarizes what has been written.

MIDDLE SENTENCE MAIN IDEAS

These are the hardest to find because the main idea is "sandwiched" between details. Fortunately, only a small number of paragraphs have the main idea in the middle. Most main ideas are in either the first or last sentence of a paragraph.



Directions: Read each of the following paragraphs. Select the sentence which correctly states the main idea of the paragraph. Write the letter in the space provided.

- _____ 1. The sun seems to be the ideal energy source. It is abundant and non-polluting. But there are some problems with solar energy. Although solar resources are abundant, they are spread out and require large areas to gather enough energy to be useful. Solar energy collectors cost money -- for raw materials, building, installation, and maintenance. Another problem is that sunshine is intermittent. The number of sunlight hours and availability of solar resources change depending on things like weather, season, and location. Matching energy needs to available solar power is also difficult.

- A. The sun seems to be the ideal energy source.
- B. But there are some problems with solar energy.
- C. Solar energy collectors cost money.
- D. Matching energy needs to available solar power is also difficult.

- _____ 2. Sea thermal power is a method of producing energy. It uses heat engines to harness the small temperature differences between the sun-heated surface of the tropical seas and the cold deep water. These engines transform heat energy into the mechanical work of spinning a turbine. Generators are connected to the turbines to produce electricity.

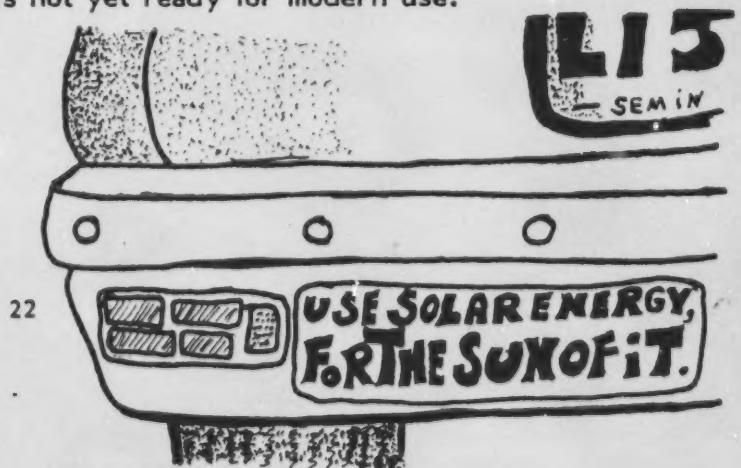
- A. Generators are connected to the turbines to produce electricity.
- B. Sea thermal power is a method of producing energy.
- C. It uses heat engines to harness the small temperature differences between the sun heated surface and the cold deep water.
- D. These engines transform heat energy into the mechanical works of spinning turbine.



3. Sea thermal plants will not require heat storage to produce power during periods of little or no sunlight. The surface of the tropical seas never falls below 78 degrees F. at any time. It is, therefore, possible to operate sea thermal power plants at close-to-full output for 24 hours a day year-round. All other proposed systems for use of the sun's energy except solar cells orbiting in space, require some means of storing heat or electricity. But since the ocean's surface waters act as a vast storehouse of solar heat, no additional storage is needed.
- A. Sea thermal plants will not require heat storage to produce power during periods of little or no sunlight.
 - B. The surface of the tropical seas never falls below 78 degrees F. at anytime.
 - C. All other systems require some means of storing heat or electricity.
 - D. Since the ocean's surface waters act as a storehouse of solar heat, no additional storage is needed.
4. Billions of years ago, nature evolved a marvelous energy-producing process by which green plants use the pigment chlorophyll to transform sunlight into stored foodstuff -- mainly starches and sugars. Today some scientists believe that our best hope for achieving long-term energy independence lies in redirecting this grand process of nature, photosynthesis, toward the production of fuel - specifically, hydrogen. Sunlight would be employed to extract hydrogen gas from ordinary water. The hydrogen, in turn, would be used in gaseous form as a substitute for natural gas or in liquefied form as a substitute for gasoline.
- A. Billions of years ago, nature evolved a marvelous energy producing process.
 - B. Today some scientists believe that our best hope for achieving long-term energy independence lies in the process of photosynthesis toward producing fuel, specifically hydrogen.
 - C. Sunlight would be employed to extract hydrogen gas from ordinary water.
 - D. The hydrogen would be used as a substitute for other fuels.



5. There is a feeling in this country, summed up by the bumper sticker saying to "split wood, not atoms," that bioconversion (burning plant tissues such as wood) is a desirable, clean, and renewable source of energy which we might be able to fall back on when our present fuels become unavailable. This feeling has shown itself in several ways: Studies have been made of the potential of New England's forests to supply energy for the Northeast. There are plans for plantations to fuel military bases. During the energy crisis of the winter of 1973, state and national forests were opened to individuals wishing to cut firewood; state forests in New York are still open for such purposes upon payment of a small fee. And woodburning stoves are enjoying a comeback.
- A. Bioconversion may be a desirable, clean, renewable source of energy to fall back on.
 - B. During the energy crisis of 1973, state and national forests were opened for cutting firewood.
 - C. Plantations may fuel military bases.
 - D. This feeling has manifested itself in several ways.
6. Since the 1850's, six million windmills have been installed in the United States. The windmill is not yet ready for modern reuse, but its time may come. A large experimental windmill built by the Department of Energy started turning in Clayton, New Mexico. It is expected to generate up to 15 percent of the electric power used by the town's 3,000 residents. It is not yet, however, an economical way to produce mass power. Small windmills for home electric use are commercially available but so expensive as to be attractive to only those whose houses are remote from any electric grid system. As with all solar energy, a storage system is necessary unless the device is used just to supplement existing power supplies.
- A. Since the 1850's, six million windmills have been installed in the United States.
 - B. A storage system is necessary.
 - C. Small windmills for home use are available.
 - D. The windmill is not yet ready for modern use.



INFERRED MEANINGS

Cartoons express the conditions, problems, and shortcomings of man using humor. They often reflect the changes in a society. By laughing at the exaggerations of a cartoon, we can often understand a problem or see a solution to a problem.

Directions: Make a scrapbook of energy-related cartoons and comic strips from newspapers and magazines. Some topics to look for are:

- Uses of solar energy
- Wind power
- High cost of energy
- Power companies
- Gasoline companies
- Synfuels
- Coal
- Oil
- Gas guzzler cars
- Imported cars
- Geo-thermal energy (geysers; hot springs)
- Dams; Hydro-electric power
- New energy inventions
- Insulation
- New kinds of houses
- "The good old days"

Example:



WHO, WHAT, WHERE, WHEN, WHY

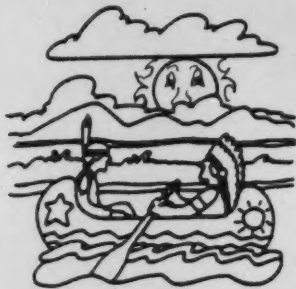
ACTIVITY 1: Transportation and the Five W's

Directions: For each of the six pictures, tell **WHAT** the means of transportation is. Then where there are blanks to fill, answer **WHO** it was who used it, **WHEN** in history it was used, and what part of the world it was used (**WHERE**), and **WHY** this means of transportation was used instead of another. Identify, too, the energy source that made it move (food, muscle power, moving water, coal, wood, petroleum, or a combination of these).

1.  What: _____ Who: <u>Arabs</u> When: <u>From the earliest history to present time.</u> Where: _____ Why: _____ Energy Source: _____	2. What: <u>Jinricksha</u> <u>Jin (a man) + riki (power) + sha (carriage)</u>  Who: <u>Japanese and Chinese</u> When: <u>From earliest history to fifty years ago.</u> Where: _____ Why: <u>Human labor was plentiful and cheap.</u> Energy Source: _____
--	---

3. What: _____

Who: _____



When: _____

Where: Rivers of North America

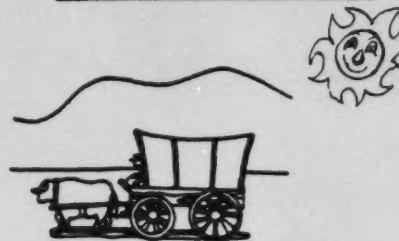
Why: _____

Energy Source: _____

4. What: _____

Who: _____

When: 100 to 150 years ago



Where: _____

Why: Low-cost way to carry all a family's belongings across a continent

Energy Source: _____

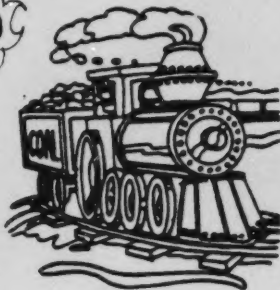
5. What: _____

Who: Passengers and
shippers of freight

When: 50 years to 150
years ago

Where: All over the
world

Why: _____



Energy Source: _____

6. What: 1. _____

2. _____

3. _____

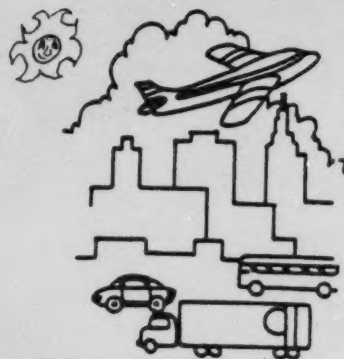
Who: Just about everyone.

When: _____

Where: _____

Why: Fast and convenient

Energy Source: _____



WHO, WHAT, WHERE, WHEN, WHY & HOW

ACTIVITY 2: The Solar Airplane

Directions: Read each paragraph below. Then answer as many of the following questions as possible for each paragraph.

- A. Who is the paragraph about?
 - B. What did he/she do?
 - C. Where did he/she do it?
 - D. When did he/she do it?
 - E. Why or how did he/she do it?
1. In recent months an extraordinary aircraft has been flying around Arizona and California. It weighs only 175 pounds. Its pilot, a schoolteacher from Bakersfield, California, named Janice Brown, weighs only 95 pounds. The plane has no fuel, no batteries. Sunlight, activating a small electric motor, turns the propeller.
 2. Paul MacCready has created a sun-driven plane, sponsored by DuPont, that should be able to climb 40,000 feet and to fly over 300 miles. No one, at least yet, pretends that the Challenger begins an age of solar-powered aircraft. Commercial prospects for solar-powered flight are rated close to zero by MacCready. What, then, does Solar Challenger accomplish? Does it make history? Certainly. Does it rate a spot in a museum, an item in the record books? Yes. Is it a boost for solar energy? Perhaps. But mostly it's fun.
 3. Even with low-angle winter sunlight, Solar Challenger was able to fly 14 miles in test flight. Black solar cells in wings and tail convert the sun's power to electricity that drives propellers.
 4. "The underlying reason I'm involved in solar-powered flight is my great disenchantment for the way the country is approaching the energy problem: too many short-term influences on political leaders, with the leaders operating in a fishbowl of media attention. A while ago I realized that half the people in this country would be willing to send my kid to war so they can keep on driving the same cars they've been driving and keep their houses warm instead of solving the problems of energy. Our American motto seems to be 'more'. I asked myself what I could do to help decrease the country's dependence on foreign oil."

DETAILS

Directions: Read the following paragraphs. Then answer the questions at the end by placing the letter of the correct answer in the blank next to the question number.

FOSSIL FUELS

Most of our energy today comes from fossil fuels. Fossil fuels are fuels which are formed from the fossil remains of organic materials (dead plants and animals). After millions of years, these remains become buried in the ground and take the form of coal, oil, and natural gas.

Fossil fuels are called non-renewable fuels because they can not be renewed or replaced. Once we use them up, our supplies will be gone. Actually, fossil fuels are renewable - if we could wait 200 or 300 million years for more coal and oil to form! But since this is not possible, we must realize that once our fossil fuels are gone, we will have no more oil, natural gas, or coal to use.

Today, our oil and natural gas are almost completely depleted or used up. Natural gas is becoming very hard to find and old discoveries will not last much longer. We are also finding less and less oil. The countries of the Middle East possess most of the oil that is left in the world, but even they are running low.

In the United States, coal is our most abundant fossil fuel. We have lots of coal underground. We have some oil too. Some of this oil is in underground wells, but we have much oil imbedded or contained in a kind of rock called oil shale. Both of these fossil fuels, coal and oil, may help us to get the energy we need right now. But it must be remembered that oil shale and coal are non-renewable. They will run out someday.

We are currently using coal in some of our power plants to generate electricity. Oil shale is not being used much yet. But both oil shale and coal have some problems. These problems need to be carefully considered before we decide to use either of these fuels on a large-scale basis.

Oil shale is a kind of rock. Oil is inside of the rock, so the rock must be crushed and heated super-hot to get the oil out of it. It takes a lot of energy to dig, crush, and heat the rock to get the oil out. For every barrel of oil produced this way, 1/2 of a barrel has to be used up. Thus, the amount of oil actually gained in the end is not as much as it looks like.

Another problem with oil shale is that 1,000 tons of rock must be crushed to get 1 barrel of oil. Here in the United States, we use about 6 million barrels of oil per day. To get that much oil out of oil shale than, we would have to crush 6 billion tons of rock per day! Even if we produce only half or even a fourth of that amount, this is still a terrible problem.

Coal is the most abundant fossil fuel in the United States today. But it too poses some difficulties. When coal is burned in power plants, it creates a lot of smoke. This smoke will pollute the air we breathe. When coal is burned, it not only produces smoke but it releases much sulfur into the air as well. Sulfur, if released in great amounts, can do considerable harm. The sulfur rises into the air and may come back to earth in the rainwater. When a lot of sulfur gets into rainwater, the rain is called acid rain. This acid rain can do a lot of damage. It kills or harms crops and plants. It may even make the soil less able to grow things. As the acid rain falls into rivers, lakes, and streams, it kills fish. Acid rain also affects the groundwater. Groundwater is the water that humans drink. If this water becomes too acidic, or full of acid, humans may not be able to drink it.

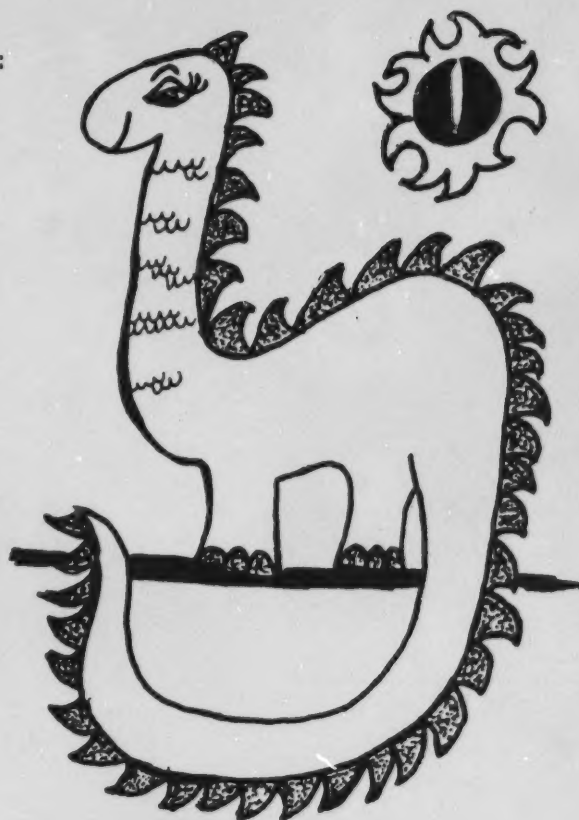
You can see, then, that fossil fuels have many problems. They are running out, for one thing. But as we turn to the fossil fuels we have left, other problems emerge. The problems associated with oil shale and coal will not be as severe if we use them wisely. But if we attempt to use oil shale and coal for all of our energy needs, then we may be faced with serious problems.

Questions: Finding key details. How closely did you read?

- _____ 1. Fossil fuels are fuels formed from:
 - a. nuclear fusion
 - b. remains of plants and animals
 - c. the sun's radiation
- _____ 2. Three types of fossil fuels are:
 - a. coal, uranium, oil shale
 - b. natural gas, coal, ultraviolet radiation
 - c. oil, natural gas, oil shale
- _____ 3. A non-renewable resource is one that:
 - a. can be replaced
 - b. cannot be replaced
 - c. cannot be conserved
- _____ 4. Which of the following is not a problem associated with coal burning?
 - a. wasted rock
 - b. acid rain
 - c. pollution
- _____ 5. Which of the following is not a problem associated with getting oil out of oil shale?
 - a. uses much energy
 - b. wasted rock
 - c. acid rain
- _____ 6. The most abundant fossil fuel in the United States today is:
 - a. oil
 - b. natural gas
 - c. coal

Vocabulary:

- _____ 1. Another word for imbedded is:
- a. contaminated
 - b. demanded
 - c. contained
- _____ 2. Another word for depleted is:
- a. used up
 - b. deposited
 - c. input
- _____ 3. Another word for renewed is:
- a. reformed
 - b. replaced
 - c. refined
- _____ 4. Which item is renewable:
- a. oil
 - b. coal
 - c. solar energy
- _____ 5. Which item is not a fossil fuel:
- a. natural gas
 - b. uranium
 - c. oil
- _____ 6. In the last sentence of paragraph seven (7), the word produce means:
- a. exhibit
 - b. grow
 - c. manufacture
- _____ 7. In the fourth sentence of the last paragraph, the word associated means:
- a. connected
 - b. combined
 - c. continued



Finding the Main Idea

- _____ A good title for this reading would be:
- a. Fossil Fuels: A Plentiful Resource
 - b. Fossil Fuels: A Renewable Energy
 - c. Fossil Fuels: What We Have Left

CAUSE AND EFFECT

The little boy was crying (effect) because his balloon floated away. (cause)

There can be many causes for one effect and more than one effect for each cause.

It's raining. (cause # 1)

She doesn't have a raincoat. (cause # 2)

So, she won't go outdoors. (effect)

He got soaked. (cause)

So, he caught a cold (effect # 2)

and missed school. (effect # 2)

Sometimes an effect can turn into the cause of the next event.

(1) Sam left the door open. (cause)

(2) His dog bolted down the street.
(effect - This effect becomes another cause.)

(3) Sam lost two hours looking for his dog. (effect)

Look out for Why and Because.

Why is a signal. It tells you that the question is looking for a cause. It usually comes right before the effect. Because is also a signal. It tells you what the cause is.

Effect: Why are you puffing so hard?

Cause: Because I ran.

Effect: Why is the city so dirty?

Cause: Because factories and cars make the air unhealthy to breathe.

Effect: Why is the grass green?

Cause: Because the grass has chlorophyll in it.

REMEMBER:

- In real life, a cause comes before an effect, but in reading, you sometimes come to the effect first.
- Everything that comes before an effect does not have to be a cause.
- An effect may have many causes.
- Sometimes a cause is the effect of something that came before it.

CAUSE/EFFECT

Directions: Read the following paragraphs. Make two columns on your paper. Label one column CAUSE and one column EFFECT. Then list a cause and effect stated in each paragraph.

1. The fuel crisis of 1973-1974 totally focused the world's attention on the mammoth energy problems we face today. The shortages in energy came about simply because we were using more energy than we were producing. In other words, the demand exceeded the supply.
2. Even though we are now producing our own oil it is not enough because much of it comes from old oil wells that have few years left to produce. Our own oil wells cannot supply us with enough oil to keep our industries and economy running at a normal rate.
3. We have finally been brought to full understanding of the energy crisis because of the oil embargo. Since the oil embargo, much discourse has been held on whether the shortages are imaginary or real. Even if some of the claims of the shortage are exaggerated, the fact still remains that shortages do exist and they will increase with our growing demand for this valuable fuel.
4. The oil embargo, therefore, created a need to find alternate sources of energy. Obviously, these sources of energy must come from within the continental United States so that foreign countries cannot control our destiny.
5. To make up for oil shortages, the United States started to import oil from foreign countries. Although importing this oil originally started decades ago in small quantities, today this has increased to millions of barrels of oil per year. If we continue with the present consumption we will double the amount of oil needed from foreign countries by the year 1985.
6. Our industries and commerce have been based on cheap, abundant energy sources. We consume well over 30 percent of all the oils produced throughout the world, while we only have 7 percent of the total world population. When looking within our borders for natural fuel such as oil and gas we quickly realize that the supply cannot possibly satisfy our demand. Even with a reduction in the amount of needed fuels, alternate sources of energy must be found. One of those sources of energy is solar energy.

FACT AND OPINION

Directions: Read the newspaper article on the following pages. Then read the quotes from the article printed below. For each statement, place an F in the blank if it is a fact. Place an O in the blank if it is an opinion. Underline the word or words in each statement that helps you decide if it is a fact or an opinion.

- _____ 1. Litka predicts by the end of this decade homeowners can short-circuit local power companies and supply up to 75 percent of their own electricity.
- _____ 2. The three-bedroom, two-bath, wood-frame experimental house looks like any other new Florida home except for 168 solar cell panels on its roof.
- _____ 3. Electricity is generated when sunlight pierces the dark surface of the panels, freeing electrons and creating a flow of direct current.
- _____ 4. One meter was reading the current being produced by the solar cell.
- _____ 5. The problem with present photovoltaic cells is the cost, and the few systems in use today power remote desert water pumps and sea bouy lights.
- _____ 6. The system on the solar center house was designed and installed at a cost of \$55,000.
- _____ 7. The current assumption is that it will pay for itself in 15 years, and that's without any tax incentives like there are now for the installation of solar water heaters.
- _____ 8. Big oil is smart enough to know it won't be in business in 50 years if it depends on fossil fuels.
- _____ 9. Backus believes solar cells can provide 2 percent to 10 percent of the nation's electricity by the year 2,000.
- _____ 10. On the basis of the technology I'm convinced that solar cell systems can be built at low cost, but I don't know how to project marketability.

FACT AND OPINION
"NEWSPAPER ARTICLE"

Can Homeowners 'Short-Circuit' Power Firms?

Imagine getting a monthly check, instead of a bill, from your local power company and you'll understand why Art Litka grins everytime he reads the power meters at an experimental solar house.

Litka predicts by the end of this decade homeowners can short-circuit local power companies and supply up to 75 percent of their own electricity.

They'll do it with energy producing photovoltaic devices attached to the roofs of their homes, and, as the technology progresses, perhaps from cell banks capable of supplying entire neighborhoods.

"No alternative that I'm aware of is a panacea," says Litka, the Director of Photovoltaic Research at the Florida Solar Energy Center. "But this is the one that makes the most sense."

Litka's confidence stems from the early success of an experimental photovoltaic house -- one of eight in the country -- built at the solar energy research site just south of Kennedy Space Center.

The three-bedroom, two-bath, wood-frame experimental house looks like any other new Florida home except for 168 solar cell panels on its roof.

The solar panels -- rated at 30 watts each -- have three rows of silicon semi-conductors sealed in four-inch discs. The system has no moving parts and experts estimate cell life of 20 years.

Electricity is generated when sunlight pierces the dark surface of the panels, freeing electrons and creating a flow of direct current. This current then goes to an inverter box that turns it into alternating current to power household appliances like dishwashers, ranges, and air conditioners.

"The solar portion of this system will contribute about 750 kilowatt hours a month," says Litka. "That's about three-quarters the power consumed by an average family in Florida."

On a sunny day last week Litka took a visitor inside the solar house to read the meters attached to a garage wall. One meter was reading the current being produced by the solar cells. The other was showing "excess" current the solar house was feeding into the local Florida Power & Light Co. grid.

"You look at this like a bank account," Litka said. "The solar cells provide the deposits, the power you use is the withdrawal, and what's left in the balance."

The problem with present photovoltaic cells is the cost and the few systems in use today power remote desert water pumps and sea buoy lights.

The system on the solar center house was designed and installed at a cost of \$55,000, which is beyond the reach of homeowners.

But Litka and Dr. Charles E. Backus, Director of Solar Research at Arizona State University, say federal and private researchers are determined to cut the cost of home solar electric systems to \$10,000 in the next five to ten years.

At that price, says Backus, photovoltaic electricity will be cheaper per kilowatt hour than conventional power in Boston and Phoenix and competitive with the cost of power in Miami.

"The current assumption is that it will pay for itself in 15 years, and that's without any tax incentives like there are now for the installation of solar hot water heaters," Backus said.

Backus believes solar cells can provide 2 percent to 10 percent of the nation's electricity by the year 2000. The challenge, he said, will be getting people to buy them.

Besides paying \$10,000 for the unit, homeowners will need assurance their utilities will repurchase "excess" power and that skilled people will be available to install and maintain the system.

The first systems on the market won't give homeowners total energy independence. They'll still have to rely on their utility company for power at night and on rainy days. That's because batteries and devices to store solar cell produced energy are still in the developmental stage.

Most of the system distributors are small, but those working on solar cell technology include such titans of oil and electronics as Mobil, Atlantic Richfield and Westinghouse.

Backus and Litka say there's good reason for big company involvement. They have the money to invest and the scientific know-how to reduce the cost of silicon-semiconductor cells. And they want to survive.

"Big oil is smart enough to know it won't be in business in 50 years if it depends on fossil fuels," says Backus. "The companies realize they better start diversifying and become energy companies."

The power companies, meanwhile, are keeping close tabs on the solar projects. FPL spokesman Tracy Smith says utilities are hoping photovoltaic systems may negate the need for new power plants.

"It's always cheaper not to build a new plant," he says. "The more options we have the better off we are."

The U.S. Department of Energy is also involved in photovoltaic research, but no one knows yet what effect the proposed budget cuts of the Reagan Administration will have on the current \$150 million research and development program.

Backus, with fingers crossed, says the programs should survive without major reductions because photovoltaic research has shown steady results.

"On the basis of the technology," Backus said, "I'm convinced that solar cell systems can be built at low cost, but I don't know how to project marketability."

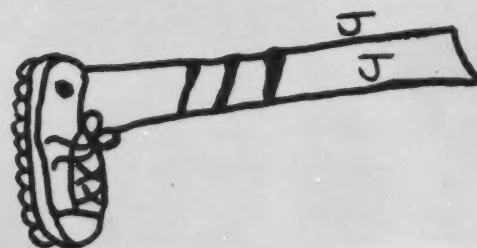
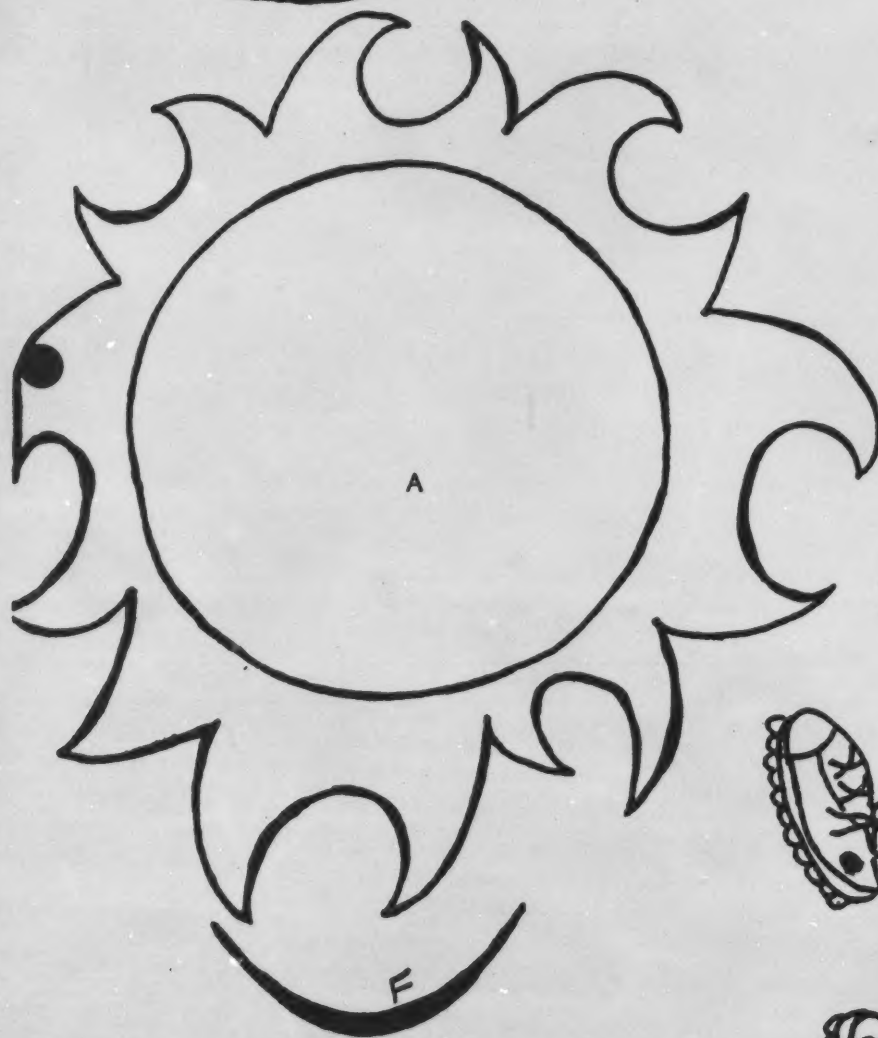
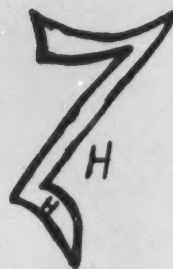
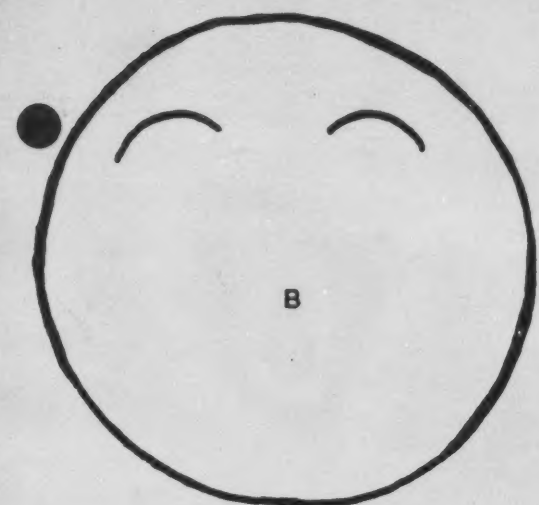
The Solar Energy Industries Association is projecting sales of \$157 million in 1982, double the sales this year.

FOLLOWING WRITTEN DIRECTIONS

SOLAR SUNNY

Directions: Follow these directions to assemble "Solar Sunny"

1. Cut out all the pieces of "Solar Sunny"
2. Glue the circle (B) containing the eyebrow arches into the center of the sun circle (A). Be sure the arches are at the top of the circle.
3. Glue the left eye (C) onto the face under the left eyebrow.
4. Glue the right eye (D) onto the face under the right eyebrow.
5. Glue the nose (E) onto the face below the eyes.
6. Glue the mouth (F) onto the face so that Sunny will be smiling.
7. Glue the left arm (G) onto the sun ray (A) so that the shoulder is level with the eyeballs.
8. Glue the right arm (H) onto the sun ray (A) so that the shoulder is level with the eyeballs.
9. Glue the left leg (I) onto the sun ray (A) so that the leg is at the bottom of the face.
10. Glue the right leg (J) onto the sun ray (A) so that the leg is at the bottom of the face.
11. When you finish, your "Solar Sunny" should look like this:



SOURCES OF INFORMATION

Solar Energy In A Magazine

With the need for alternate energy sources becoming more noticeable and desirable every day, an obvious source is the sun. What needs do we have as far as energy is concerned? How can solar energy fit these needs? What research and development has been done in the area of solar energy? Most of the recent work is too new to be found in textbooks but is instead found in various magazine articles. In this activity you will be using your library to find some of this information.

This research should enable you to:

- find and list the available sources of information regarding solar energy.
- see what has been done in the area of solar energy research and development.
- learn to use the media center for research.

Guide To Periodical Literature

ACTIVITY 1

- Directions:
1. From the Reader's Guide to Periodical Literature or other library references, find and list the articles or books concerning the energy crisis, sources of energy, and solar energy. Use one or more of the Library Resource Data Sheets to record this information.
 2. Using your list, find as many of these articles as possible.
 - a) Read five of them.
 - b) Note the important parts on a separate sheet of paper.
 - c) If a source is not available, also note this on your data sheet.
 3. The information you collect will serve as a reference to you, your class, and your teacher in studying solar energy. It will also serve as a bibliography for your own research of solar energy. The sources which you could list, yet not find in your library, may be available in other libraries such as county, regional, or even state libraries.
 4. Answer these questions:
 - a) Which magazine or reference do you think contains the best article on solar energy?
 - b) Were there any magazines or references that were too difficult for you to read?
 - c) Based on your research, how important is solar energy as a future energy source?
 5. Your teacher may assign a research paper or a report for you to do based on your sources. If so, your work is well begun!

Sun Search

ACTIVITY 2

Directions: Use the resources available in the library to answer the following questions. List the resources used on the Library Resources Data Sheet.

1. The mean daily solar radiation is measured in Langleys. This is a direct measure of the amount of solar energy received at a given location. Langleys were named for Samuel Langley, a pioneer in aeronautics and solar energy. What can you find out about Mr. Langley?
2. The reign of Louis XIV of France (1643-1715) was an era of solar experiments. Louis gained the title of Sun-King. Why?
3. Archimedes saved the Greek city of Syracuse from Marcellus and his Roman fleet by using reflectors to concentrate solar energy on invading ships. The fleet caught fire and burned. During the siege of Constantinople, another Greek, Proclus, remembered history and burned another enemy fleet. Is there any credibility to these stories?
4. In 1695, Georges Buffon proved the potential of concentrating solar energy by igniting wood at 200 feet, and melting lead at 130 feet. He used a parabolic-shaped mirror. How are these mirrors used today?
5. Antoine Lavoisier (1743-1794) built a solar furnace with curved glass sections filled with wine. The furnace was used to melt platinum at about 2,000°C. How are solar furnaces being used today?
6. There is more relative energy in the ultra-violet range of the light wave. It "strikes harder." Compared to other forms of light energy, ultraviolet is a steel ball, visible light is a golf ball, and infrared is a rubber ball. What is being done to capture this ultraviolet energy?
7. Our sun has surface temperatures of 10,000°F and interior temperatures of 20 million degrees Fahrenheit. The diameter is 864,000 miles, and its mass is 330,000 greater than the earth's. How does it compare with other stars?
8. The radiation that reaches earth is 9 percent ultraviolet, 41 percent visible, and 50 percent infrared. The total radiation absorbed by the earth is 1.72×10^{17} watts, or 232 trillion horsepower. Devise an energy budget that uses 1 percent of this power.
9. The mean value of the solar constant is 1.395 kilowatts per square meter of the earth's surface. If all this energy was collected, how much land would be needed to provide enough electrical energy for your city or home?

10. In the 1900's, Eastern Sun Power Company of Cairo, Egypt, built the world's largest solar power plant. It produced 50 to 100 horsepower but was abandoned during World War I when fuel-fired systems became available. What kinds of solar power plants are being developed today?
11. The solar energy reaching the earth is but one-thousand-millionth of the sun's total output, yet this is 2,000 times the requirements of Americans. The yearly solar radiation received in the U.S. is 9,000 trillion kilowatts, the equivalent of 1,200 billion tons of coal. What steps are being taken to use this renewable source?
12. About 30 percent of the sun's energy that strikes the earth's atmosphere is immediately bounced back into space. The atmosphere, land masses, and the oceans absorb 45 percent in the form of heat. Almost 23 percent operates the water cycle, and about 1 percent is used in air and ocean circulation. Less than 1 percent is used by plants. How many kilowatts are left? Is that enough to power the globe?
13. In 1880 a solar-powered press was working in France. What happened to it?



LIBRARY RESOURCE LIST DATA SHEET

For Activities 1 & 2

TITLE OF OF THE ARTICLE OR REFERENCE	AUTHOR IF INDICATED	MAGAZINE OR OTHER REFERENCES	VOLUME/ ISSUE	DATE	PAGES	WHERE AVAILABLE

Research Suggestions

ACTIVITY 3

Directions: Research and write a report on one of the following topics. List your resources in a bibliography at the end of your report. Your teacher may wish to make this an oral report as well, so be prepared!

1. How much sun is safe in sunbathing?
2. What causes suntans?
3. Why do some people burn and others tan?
4. What are the dangers of quick tanning lotions?
5. What are the dangers in using sunlamps and tanning booths?
6. What conditions can be cured by using sunlamps and tanning booths?
7. Describe the symptoms of heat exhaustion and the appropriate treatment for it.
8. Determine how sunlight promotes the production of Vitamin D and influences other vitamins.
9. What are the effects of prolonged and unseasonal use of sunglasses upon the internal structure of the eyes?
10. What are the effects of different photo-periods upon the behavior and physiology of human beings?
(Examples: Full Moon; Solar Flare Activity)



TABLE OF CONTENTS

A table of contents is at the beginning of a book. It lists the units or chapters in the book. A table of contents tells the order in which these chapters appear in the book.

Directions: Use the Table of Contents below to answer the questions.

TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
1. MEET THE SUN	1
2. SOLAR FURNACE	13
3. CARDBOARD COOKER	31
4. A SOLAR OVEN	48
5. WATER HEATER	57
6. A SOLAR STILL	71
7. RADIO	91
8. A SOLAR POWERED AIRPLANE	109
9. MORE SOLAR PROJECTS	125
10. THE SUN AND SOLAR ENERGY	135
11. FIRMS ENGAGED IN SOLAR-ENERGY APPLICATIONS	137
BIBLIOGRAPHY	141
INDEX	143

- _____ 1. On what page will a chapter begin about an airplane that is powered by the sun?
- _____ 2. What is the chapter about companies that make solar energy products?
- _____ 3. What chapter might tell how you can use the sun to cook a hot dog for lunch?
- _____ 4. Is there a list of other books about solar energy?
- _____ 5. On which page does the general chapter about the sun begin?
- _____ 6. Where else in this book besides the Table of Contents can you look for more specific page numbers for a special topic?
- _____ 7. Does this book tell how to heat water using the sun?
- _____ 8. Does this book have a chapter that tells how to use plants to shade your house from the sun?
- _____ 9. What part of this book could help you find a solar science fair project to do?
- _____ 10. Can you tell from the Table of Contents how many pages are in this book?

INDEX USE

An index is found at the end of a book. It is an alphabetical list of the topics found in that particular book. Information in the index is usually divided into topics and subtopics. When people are listed in an index, their last names are given first. Page numbers are placed after the topics so one can easily locate the information in the books.

Directions: The index on the following page is from a book on solar energy experiments. Use this index to answer these questions.

- _____ 1. Information on solar cookers can be found on what pages?
- _____ 2. Information on materials needed to build a solar cooker can be found on what page?
- _____ 3. To find out how to construct a solar cooker, one should look on what page?
- _____ 4. What other topic will give you more references for solar cooking?
- _____ 5. Where would you look to find a detailed description of the greenhouse principle?
- _____ 6. Information on solar clocks is on what page?
- _____ 7. Photovoltaic converters can be found on what pages?
- _____ 8. Which page will probably tell how hot a solar furnace can become?
- _____ 9. List the persons' names found as main topics in his index.

- _____ 10. How many pages are there with information about Fresnel lenses?

INDEX

144

Cigarette lighters, 11
 Clocks, solar, 11
 Converters, solar, 94
 Cookers, solar, 1, 9, 25, 31-47,
 49
 advantages of, 46
 commercial, 33
 construction of, 36-43,
 cost of, 9
 materials for, 33
 temperatures in, 34-35
 use of, 43-45
 see also Ovens
 Distillation, solar, 7-9,
 Ericsson, John, 4-9
 Evaporation, 74-76
 Fuel, solar, 11
 Furnaces, solar, 1, 6-7, 9,
 13-30,
 construction of, 6-7
 temperatures in, 29
 Glass sandwich technique, 22, 26
 Gliders, 109
 Greenhouse principle, 9, 48-56

145

Heaters, see Water heaters
 Heating, solar, 70
 Homes, solar, 7, 133
 Jackson, Dr. Ray, 88-89
 Kilns, firebrick, 20, 23
 Kobayashi, Dr., 88
 Langley, Dr. S. P., 48, 52
 Lenses, 6, 13
 Fresnel, 17-18, 26, 27
 plastic, 17-18
 Mont Louis solar furnace, 7
 Ovens, solar, 48-56, 60, 63, 65
 construction of, 52-56
 materials for, 51
 temperatures in, 51, 56
 Photocells, 81-82
 Photovoltaic converters, 91-92

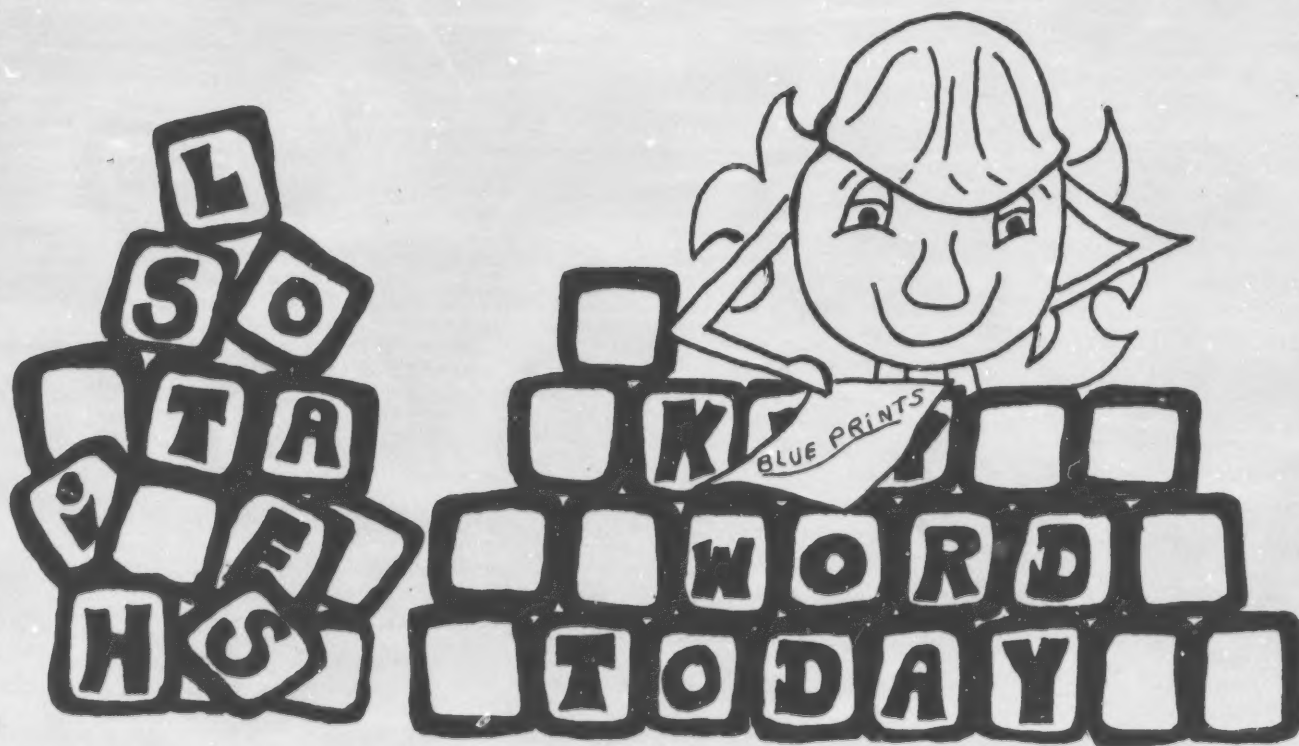


46

SUPERSUN

UNIT III

BUILDING WRITING SKILLS



NOUN PLURALS

A noun is a word which names a person, place, thing, or idea. When a noun refers to one person, place, thing, or idea, that noun is singular. When a noun refers to more than one person, place, thing, or idea, that noun is plural.

SINGULAR = one

PLURAL = more than one

RULE 1: Most nouns form their plurals by adding the letter s.

ACTIVITY 1

Directions: Complete each sentence by writing the plural noun of each singular noun.

1. Our sun is just one of the countless number of _____ found in the universe.
(star)
2. Much of our energy presently comes from fossil _____ -- oil, coal, and natural gas.
(fuel)
3. Electric power use is measured in _____.
(kilowatt hour)
4. Solar energy can help us with many _____.
(task)
5. Each square inch centimeter of solar surface radiates about 100,000 _____ per minute.
(calorie)

RULE 2: Nouns ending in s, x, ch, or sh form their plurals by adding the letters es.

ACTIVITY 2

Directions: Complete each sentence by writing the plural noun of each singular noun.

1. Many _____ raise their thermostats in the _____ summer in order to conserve energy.
(business)

2. Public buildings such as auditoriums, stadiums, schools, and _____ are trying to use less energy.
(church)
3. In some cases, the government lowers _____ when homes use building materials that help to save energy.
(tax)
4. Three magic _____ will not produce more energy. We must do our part of conserve it.
(wish)

- RULE 3:**
- A. Nouns which end in y preceded by a vowel (a, e, i, o, u) form their plurals by adding s.
 - B. Nouns which end in y preceded by a consonant (any letter but a, e, i, o, u) form their plurals by changing the y to i and adding es.

ACTIVITY 3-A

Directions: Complete each sentence by writing the plural noun of each singular noun.

1. We receive heat from the sun's _____.
(ray)
2. Conservation of fossil fuel and better use of solar energy are _____ to having energy in the future.
(key)

ACTIVITY 3-B

Directions: Complete each sentence by writing the plural noun of each singular noun.

1. Energy can be stored in _____.
(battery)
2. Huge _____ of materials, hundred of thousands of tons, are hurled outward into space from the sun.
(quantity)
3. Americans are so used to limitless energy _____ that they can hardly imagine what life might be like when the fuel really starts to run out.
(supply)

REGULAR VERBS

There are four basic parts to a verb which are called its principal parts. These principal parts help the verb express the time the action of the verb takes place. The time expressed by a verb is called its tense: present tense, past tense, future tense.

The Four Basic Verb Forms

Present	Present Participle	Past	Past Participle
flow	flowing	flowed	(have) flowed
heat	heating	heated	(have) heated
save	saving	saved	(have) saved
transfer	transferring	transferred	(have) transferred

The sentences below show how these verbs express different time.

- Heat pumps are devices that transfer heat from a cooler region to a warmer one (or vice versa) by using mechanical and/or electric energy. (present tense)
- Many people heat their homes with oil. (present tense)
- The oil flowed through the pipes. (past tense)
- Our neighbors saved money by conserving energy. (past tense)
- They will heat their water with solar energy. (future tense)

ACTIVITY 1

Directions: After reading the information above, answer the following questions.

- The four basic parts of a verb are called the _____.
- The time expressed by a verb is called its _____.
- What suffix (ending) is added to the present form to make the present participle form? _____
the past form? _____
- The past participle is the form used with have, has, or had. What suffix is added to the past participle form? _____
- When the verb save is changed to the present participle, what happens to the "e"? _____
- The suffix "ed" was added to flow to form the past tense. When a word ends in "e" such as save, what do you add to form the past tense? _____
- When the suffixes are added to the verb transfer, what happens to the last letter of that word? _____

ACTIVITY 2

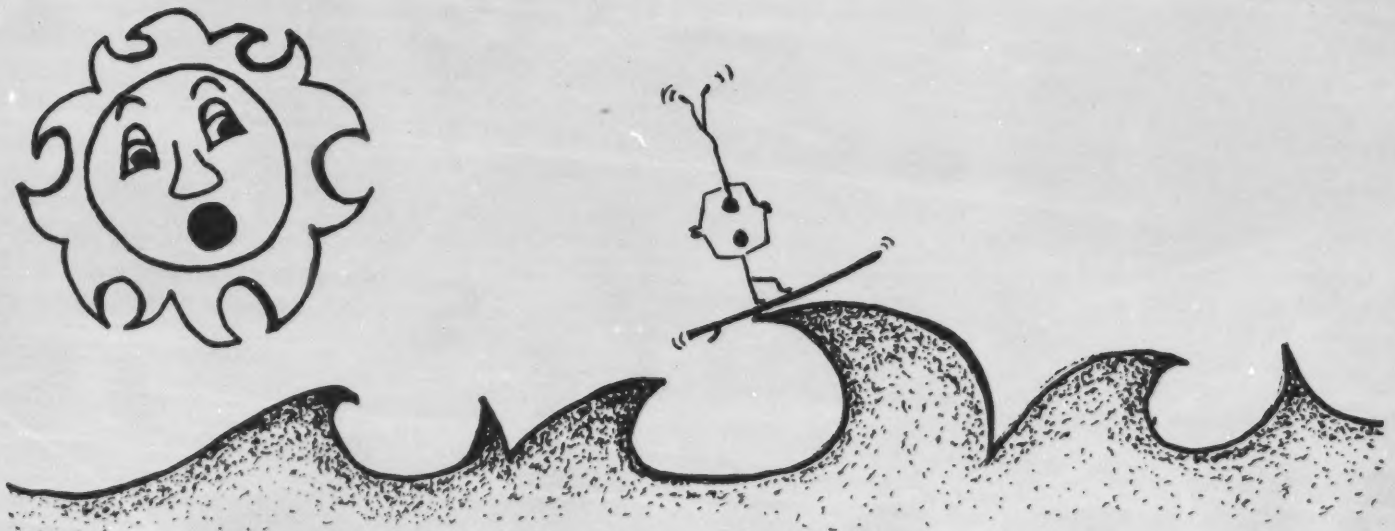
Directions: Complete each sentence below using the correct form of the verb shown in parentheses. It should be the principal part given at the end of each sentence.

- | | | | |
|-----------|-----|---|---------------------------|
| (pass) | 1. | Moving bodies _____ some of their kinetic energy on to other bodies when they collide with them. | (present form) |
| (move) | 2. | If two bodies of different weight are _____ at the same speed, the heavier weight has more kinetic energy than the other. | (present participle form) |
| (float) | 3. | The warm air _____ upward while the heavier cool air flowed in to take its place. | (past form) |
| (melt) | 4. | Solids _____ when warmed above their melting temperatures. | (present form) |
| (supply) | 5. | The sun is _____ us with energy. | (present participle form) |
| (realize) | 6. | Many people have _____ the need to conserve energy. | (past participle form) |
| (produce) | 7. | The generator is _____ electrical energy. | (present participle form) |
| (use) | 8. | Many engineers _____ their time trying to figure out how to use solar energy more efficiently. | (present form) |
| (store) | 9. | The oil company _____ the oil in large tanks. | (past form) |
| (measure) | 10. | The scientists _____ the work done by the machine in foot-pounds. | (past form) |

ACTIVITY 3

Directions: Select the correct verb for each of the following sentences.

1. The oceans have always (help, helped) man.
2. They (supply, supplying) us with minerals and medicines.
3. Today, some scientists (believe, believed) that we can generate electricity from ocean currents.
4. They also are (experimented, experimenting) with ways to get energy from changes in ocean water temperature.
5. In a floating power plant, warm water from one current will (heat, heated) a liquid that vaporizes easily.
6. The vapor will (generate, generating) electricity by driving a turbine.
7. In the past, scientists (recognizes, recognized) our needs for different energy sources.
8. They (hope, hoping) the oceans will meet some of our needs.



AUXILIARY VERBS

Auxiliary verbs are often called helping verbs. They are used with the present participle or past participle of verbs. They always come before the main verb. The auxiliary verbs and the participle are used to form a verb phrase.

Words that can be used as auxiliary verbs are:

I			II	III	IV			V
am	was	be	have	do	shall	will	can	may
is	were	been	has	does	should	would	could	might
are		being	had	did				must

EXAMPLES:

I am walking.

I was walking

I may have been walking

I had been walking

I have walked.

I can walk.



Directions: Underline the auxiliary (helping) verbs in the following paragraph.

WINDMILLS

Since the 1850's, six million windmills have been installed in the United States. A large experimental windmill built by the Department of Energy started turning in Clayton, New Mexico, last month and is expected to generate up to 15 percent of the electric power and used by the town's 3,000 residents. Because of the expense, small windmills for home electric use are used only by houses far from electric power lines. Unless the windmill is used just to add to existing power supplies, a storage system must be used.

PREPOSITIONAL PHRASES

Directions: List the prepositional phrases in the following paragraphs. Write on your own paper.

BIOMASS CONVERSION

Each year tremendous quantities of timber are harvested across the country. They are processed into lumber, plywood, or pulp. These wood operations generate large volumes of wood and bark wastes. Some of these wastes are processed into pulp, plywood, paper, and paper products. The seven million dry tons of wood and bark wastes generated on the Pacific Coast could replace some other fuels at factories.

Wood residues for fuel must first be reduced to a size that can be handled conveniently. Large volumes of wood and bark residues can be effectively reduced in size by a "hog" machine (a mechanical shredder). The particles produced by this piece of equipment are commonly called hogged fuel. Hogged fuel can include any portion of wood or bark in a particle size. This may also include sawdust, wood shavings, and ground bark. So, hogged fuel may be a combination of many types of wood wastes.

Wood wastes can be utilized in a number of ways. Large power plants are not the only means of energy recovery. Logs for home fireplace use can be made from sawdust, wood chips, and other burnable materials mixed with wax. Logs made from leaves have currently become profitable. The leaves are separated, dried and shredded before they are mixed with wax. Then they are compressed and formed into sixteen-inch-long by four-inch-diameter logs.

All wood wastes could be treated in a similar manner. These wastes are all around us and are usually available to the fuel processor at no cost. Sometimes the waste producer will even pay the fuel processor when the wastes are removed.

ADJECTIVES

Directions: Underline all adjectives in the following paragraph

SOLAR THERMAL ENERGY

Solar thermal (sun powered heat) systems can be used to produce steam in industrial processes, to generate electricity, and to supply heat for homes and offices. They can use simple flat-plate collectors that trap enough sunlight to heat air and water. A large market for solar thermal energy exists in the food, textile, and chemical industries where great amounts of intermediate temperature heat are used. Most of the equipment needed for solar thermal heating is available. Further improvements should be made on heat engines that convert solar heat into shaft power to drive a generator, air conditioner, or whatever. Solar water heaters for home use are as cheap as electric water heaters if you compare life time costs.

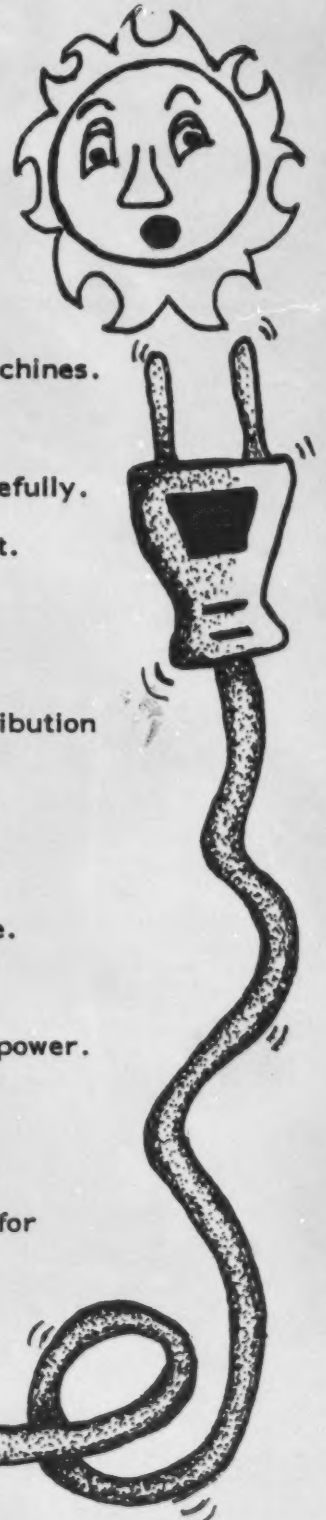
Industrialized countries, like the United States and Japan are beginning to recognize the unlimited potential of applying bountiful solar power to industrial uses. Every house and every building is a solar collector and, if our modern houses are designed correctly, solar thermal energy warm people through long, cold winters and require only limited supplies of fossil fuel as back-up energy.



SUBJECTS AND VERBS

Directions: Draw one line under the simple subject and two lines under the verb in each of the following sentences.

1. Electric power serves every modern home.
2. Many appliances work automatically because of electricity.
3. The supply of electricity seems inexhaustible to us.
4. Our lives without it would be very difficult.
5. All of us expect uninterrupted electric service.
6. The creation of electric energy is the work of men and machines.
7. The power plant converts fuel into electric energy.
8. The persons in charge of a plant watch the equipment carefully.
9. A power station produces a vast amount of electric current.
10. The generator is the heart of electric service.
11. Most generators are driven by a great steam turbine.
12. Huge outlets conduct energy from the generator to a distribution system.
13. Transmission lines carry the electric current to our home.
14. The wires in our homes distribute it for our various uses.
15. Some new homes are equipped with their own power source.
16. One new home uses solar energy for power.
17. Special roof panels convert the sun's energy into electric power.
18. These roof panels are called photovoltaic cells.
19. Batteries can store some of the electricity for night use.
20. Windmills and wind turbines can drive electric generators for home use.



SENTENCE PATTERNS

Sentences follow five basic patterns. They are:

	<u>SYMBOL</u>
Subject - Verb	N - V
Subject - Verb - Direct Object	N - V - N
Subject - Verb - Indirect Object - Direct Object	N - V - N - N
Subject - Linking Verb - Predicate Nominative	N - LV - N
Subject - Linking Verb - Predicate Adjective	N - LV - ADJ

Directions: What is the sentence pattern for each of the following sentences?
Write the sentence pattern symbol on the blank at the end of
each sentence.

- | | | |
|---|-----|--|
| 1. Some solar collectors convert solar radiation to heat. | 1. | |
| 2. These collectors are usually used for heating water. | 2. | |
| 3. Photovoltaic solar cells change sunlight directly to electricity. | 3. | |
| 4. This solid state device is simple. | 4. | |
| 5. It gives us the promise of long operating life. | 5. | |
| 6. Solar collectors require little repair. | 6. | |
| 7. Electricity is our most convenient form of energy. | 7. | |
| 8. Solar cells have a wide variety of electrical uses. | 8. | |
| 9. They can provide power for a house. | 9. | |
| 10. They are also used for railroad signals in areas with no electric power lines. | 10. | |
| 11. Some emergency radio-telephone on highways also are powered by solar cells. | 11. | |
| 12. Solar watches are now available. | 12. | |
| 13. Photovoltaic cells power some satellites. | 13. | |
| 14. Solar cells give man another means of producing electricity. | 14. | |
| 15. Storage batteries aide solar cells by making the electricity available on cloudy days and at night. | 15. | |

COMPOUND SUBJECTS OR VERBS

The word compound simply means having two or more similar parts that are joined together. Sometimes we want to show that two or more subjects are doing the same action or that the same subject is doing two or more things. We can join these similar parts of a sentence with words like and and or. Subjects or verbs connected in this way are called compound.

EXAMPLE: Gasoline and diesel oil provide the energy needed to drive our vehicles.

(Compound Subject - Two things provide the energy.)

Wind and biomass are being used by some people to reduce their dependence on fossil fuels.

(Compound Subject - Two things are being used.)

The greenhouse glass admitted shorter wave solar radiation but trapped the heat of longer wave infrared radiation.

(Compound Verb - The greenhouse glass did two things - admitted and trapped.)

ACTIVITY 1

Directions: Write the compound subjects found in each sentence.

1. Oil and coal are fossil fuels.
2. Glenn T. Seaborg and his associates discovered plutonium and neptunium in 1940.
3. In earlier times wood and coal were mainly used for heating homes.
4. Both gasoline and heating oil are made from crude oil.
5. Food, energy, and mineral resources are used up at a faster rate when the population of the earth increases.

ACTIVITY 2

Directions: Write the compound verbs found in each sentence.

1. Our homes are heated in the winter and cooled in the summer.
2. Scientists researched and discovered ways to use sources other than fossil fuels for our energy supply.
3. Our neighbor designed and built his energy saving home.
4. He bought a solar water system and installed it on the south side of his house.
5. We must conserve fossil fuels and use alternative sources of energy.

ACTIVITY 3

Directions: Combine parts of the two short sentences in each item below with the word and. Each sentence you write should have either a compound subject or compound verb.

Example: The oil burned.) The oil and coal burned.
 The coal burned.)
 The oil burned.) The oil burned and became heat energy.
 It became heat energy.)

1. Heat energy melts solids.
 Heat energy changes liquids into gases.

2. Land masses heat up faster than water masses.
 Land masses cool down faster than water masses.

3. The air expanded.
 The air became less dense.

4. The evacuated tubes collected energy from the sun.
 The photovoltaic cells collected energy from the sun.

5. Oil can be changed into electrical energy.
 Motion can be changed into electrical energy.

SUBJECT AND VERB AGREEMENT

Singular and Plural - Subject and Verbs

When a noun refers to one person or thing, it is singular in number. When a noun refers to more than one, it is plural in number.

Examples: (Singular) atom, sky, fuel, mass
 (Plural) atoms, skies, fuels, masses

A singular subject must have a singular verb. A plural subject must have a plural verb.

Examples: (Singular) Energy causes the earth's plants to grow.
 (Plural) Copper wires look the same whether or not they are carrying electricity.

(NOTE: When s or es is added to many verbs, they become singular -- not plural.)

ACTIVITY 1

Directions: In each of the following sentences, two verbs are written in parentheses. Choose the one which agrees with the subject. Write the subject and verb after the number of the sentence.

Example: Stored energy (take, takes) many different forms.
 energy takes

1. When cold water (absorb, absorbs) energy, its temperature rises.
2. Food (provide, provides) the energy we need to live and grow.
3. Generators (convert, converts) mechanical energy to electrical energy.
4. Electricity (depend, depends) on the flow of electrons.
5. A moving body (pass, passes) some of its kinetic energy on to another body when it collides with it.
6. Sound waves (pass, passes) their motion from one to another.
7. Our oceans (contain, contains) many currents.
8. Some scientists believe that we can (generate, generates) electricity from ocean currents.
9. Small cars (use, uses) less fuel.
10. We (realize, realizes) that riding a bicycle or walking helps make some energy sources last longer.

Using "Is" or "Are"

Use is when you speak of one person or thing.

Example: Electrical energy is produced by generators.

Use are when you speak of more than one person or thing and with the word you.

Example: The generators, in turn, are powered by coal, oil, gas, water power, or nuclear reactors.

Sometimes the subject follows the verb as in sentences beginning with there, here, and where. Be sure to find the subject and make the verb agree with it.

Example: There is an energy crisis in the world today. (Singular)
There are many forms of energy. (Plural)

ACTIVITY 2

Directions: Choose whether is or are is correct for each sentence.

1. Energy (is, are) neither created nor destroyed.
2. There (is, are) many ways of storing energy.
3. Gas (is, are) harder to store than coal or oil because it must be kept in a closed tank.
4. There (is, are) a transfer of energy when you hit a ball with a bat.
5. Many homes (is, are) heated with electricity.
6. Electrons (is, are) the particles or bundles of energy which make up the outer portions of atoms.
7. There (is, are) about half a million miles of gas in the United States today.
8. Heat itself (is, are) actually a form of motion, only it (is, are) a motion we cannot see.
9. Where (is, are) our energy supply for the future?
10. You (is, are) one of the keys to conserving our depleting energy sources.



COMPOUND SENTENCES

Sometimes two short simple sentences are combined by a connecting word (conjunction) to express a single thought more effectively. And, but, or, for, and yet are conjunctions that can be used to form these simple sentences into a compound sentence. A comma must be placed before the conjunction to keep the sentences from running together.

Example: (Two simple sentences)

Oil is a limited resource. Sooner or later it will be depleted.

(Compound sentence)

Oil is a limited resource, and sooner or later it will be depleted.

ACTIVITY 1

Directions: On your own paper, rewrite each set of simple sentences below combining them into one compound sentence using the conjunction given in parentheses. Remember to place a comma before the conjunction.

1. The energy crisis will be with us for a long time.
We can make use of it by deciding what things are really important. (but)
2. It is true that the sun is always supplying us with energy.
In the future, it could be that we will use up all of the energy that has been stored in our fossil fuels -- coal, oil, and natural gas. (yet)
3. Solar energy is the ideal energy source.
It is clean to produce, clean to use. (for)
4. The United States has only 7% of the world's population.
We use over 30% of the world's energy. (yet)
5. If we conserve, we'll need less energy.
We'll have less waste and pollution. (and)
6. We must conserve our energy.
Our supply will run dangerously low. (or)
7. Reduced driving speeds help save gasoline.
They also cut down on accidents. (and)

SENTENCE COMBINING

ACTIVITY 1

Directions: Take these examples of facts or "kernel" sentences and transpose them into more mature sentences.

Example of sentence combining:

1. Coal is a rock.
2. It is sedimentary.
3. It is combustible.
4. It is formed from plant materials.

Sentence: Coal is a combustible sedimentary rock formed from plant materials.

TOPIC: COAL

1. Coal is a fuel.
 2. Coal comes from fossils.
 3. Coal is abundant.
-
-

4. Coal is a resource.
 5. It will last.
 6. It can be recovered.
-
-

7. Coal is a fuel.
 8. It is in reserve.
 9. It will last 100 years.
-
-

10. Technology will improve.
 11. It will make reserves last longer.
-
-

12. Coal produces power.
 13. In 1978 it made up 18% of the total power consumed.
-
-

ACTIVITY 2

Directions: Take these examples of facts or "kernel" sentences and transpose them into more mature sentences.

TOPIC: WATER POWER

1. Water power generates electricity.
 2. Electricity is used in homes.
 3. Electricity is used in industry.
-
-

4. Water power plants are installed.
 5. They are located on rivers.
 6. They are located where waters move swiftly.
-
-

7. Water power is clean.
 8. It is cheap.
 9. Fossil fuel power plants are not cheap.
-
-

10. Water power plants are being built.
 11. They are increasing
 12. They will double by the year 2000.
-
-

ACTIVITY 3

Directions: Take these examples of facts or "kernel" sentences and transpose them into more mature sentences.

TOPIC: SOLAR POWER

1. Energy comes from the sun.
 2. It is abundant.
 3. It is a resource.
-
-

TOPIC: SOLAR POWER (Cont'd.)

4. Solar energy can be used.
 5. It can make steam.
 6. It can make electricity.
 7. It can provide heat.
-
-

8. The sun's energy can be used.
 9. It can produce electricity.
 10. The production is expensive.
-
-

11. Heating water is a current use.
 12. It is promising.
 13. It is applied solar energy.
-
-

14. Solar hot water heaters work.
 15. They can save money for Americans.
 16. They provide many jobs for people.
-
-

17. Solar hot water heaters are used in the United States.
 18. Americans installed 200,000 in 1978.
-
-

19. The sun makes energy.
 20. It is a clean, abundant source of energy.
 21. It does not make air pollution.
-
-



ACTIVITY 4

Directions: Take these examples of facts or "kernel" sentences and transpose them into more mature sentences.

TOPIC: WIND POWER

1. Windmills were used widely.
 2. They were used in the 1800's.
 3. They were used in the United States.
 4. They were used to produce power.
-
-

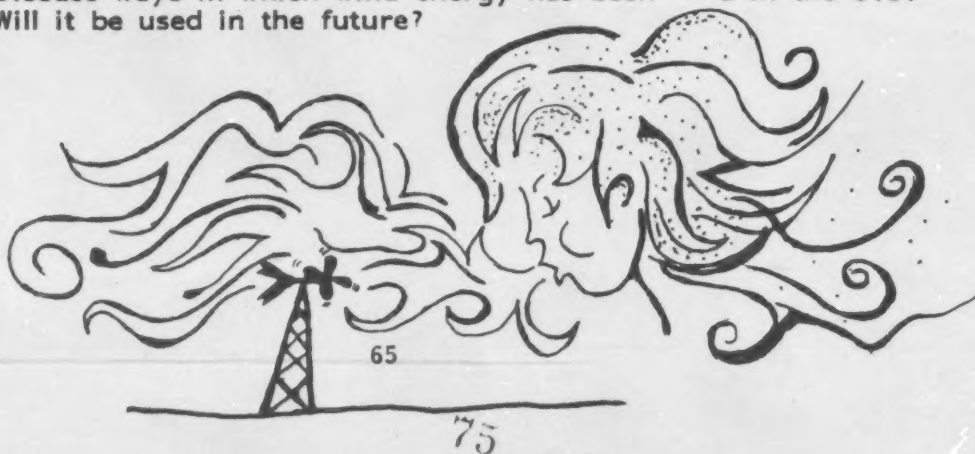
5. Windmills were used to pump water.
 6. Water comes from the ground.
 7. It is used for cattle.
 8. It is used for crops.
-
-

9. Windmills are used today.
 10. They are used in small units.
 11. They make mechanical energy.
 12. They make electrical energy.
-
-

13. The United States government plans.
 14. It plans to use more wind energy.
 15. It plans more use by the year 2000.
-
-

16. Wind energy could help meet our needs.
 17. It could produce 5-10 percent of the nation's energy.
-
-

Discuss ways in which wind energy has been used in the U.S.
Will it be used in the future?



WRITING A LETTER

Directions: Choose one of the suggestions below and write a letter and envelope. Include only information which is needed for the purpose of the particular letter.

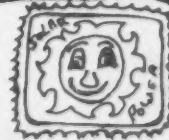
e.g., Include what is desired or the problem.

Include when it is needed or when it happened.

Include what action is requested and how it is to be done.

1. Write to Governor D. Robert Graham, The Capitol, Tallahassee, FL 32301, about your reaction to his TV "Save It, Florida" advertisements. Express an opinion.
2. Write to your State Representative or Senator about an energy issue (e.g., 55 mile per hour speed limit, increased taxes on gasoline, electricity costs). Express an opinion.
3. Write a letter to the editor of your local newspaper on a local energy issue. Make an appeal to other readers.
4. Write a letter to a State Agency to get information on an energy topic (e.g., solar energy). See the list of agencies at the end of this section. Make a request for action.
5. Write a letter of appreciation to officials or to agencies for their actions on energy issues or conservation. State praise or thanks.
6. Write for information on new energy careers: Technical Information Center, U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37830. Make a request.
7. Write a letter to the President telling him what you think should be done about America's energy problem: The President, The White House, Washington, D.C. 20500.

BOBBY SWARTZ
402 LAKE DRIVE
LAKE MARY, FL. 32746



THE PRESIDENT
THE WHITE HOUSE
WASHINGTON, D.C. 20500

ENERGY INFORMATION SOURCES

FLORIDA AND NATIONAL

CENTER FOR RENEWABLE RESOURCES

Address: Center for Renewable Resources
1028 Connecticut Avenue, NW
Washington, DC 20036

Phone: 202/466-6880 or 642-1009

- Solar and Conservation Surveys and Studies
- Solar Legislative Issues

DOE TECHNICAL INFORMATION CENTER (DOE-TIC)

Address: DOE Technical Information Center (DOE-TIC)
Citizens Assistance Section
P. O. Box 62
Oak Ridge, TN 37830

Phone: 615/576-1304

- Publications (Energy Production, Use, Conservation)
- Classroom Materials
- Energy Film Library (Free Loans)

FLORIDA SOLAR ENERGY CENTER

Address: Florida Solar Energy Center
Public Information Office
300 State Road 401
Cape Canaveral, FL 32920

Phone: 305/783-0300

- Publications (General and Technical)
- Alternative Energy Library
- Workshops and Short Courses
- System Standards and Testing

FLORIDA SOLAR ENERGY COALITION

Address: Florida Solar Energy Coalition
Environmental Information Center
935 Orange Avenue
Winter Park, FL 32789

Phone: 305/644-5377

- Build Your Own Solar Water Heater (\$3.00)
- Solar Heating for Swimming Pools (\$4.50)
- General Information

GOVERNOR'S ENERGY OFFICE

Address: Governor's Energy Office
Energy Information Center
301 Bryant Building
Tallahassee, FL 32301

Phone: 904/488-6143 or 488-6764

- Policy Planning and Analysis
- Conservation Programs
- State Energy Allocation
- Grant Programs



INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

Address: Institute of Food and Agricultural Sciences
Center for Environmental and Natural Resources Program
3038 McCarty Hall
University of Florida
Gainesville, FL 32611

Phone: 904/392-1511 or 392-1915

- Energy Extension Service
- Research Activities
- Publications/General Information

NATIONAL SOLAR HEATING AND COOLING INFORMATION CENTER

Address: Solar Heating
P. O. Box 1607
Rockville, MD 20850

Phone: 1-800/523-2929

- Information on Solar Applications (Domestic Hot Water, Heating, Cooling)
- Information on Solar Demonstration Grants
- Lists (by State) of Solar Professionals, Speakers, Industry, etc.
- Travelling Solar Exhibits

PUBLIC DOCUMENTS DISTRIBUTION CENTER

Address: Consumer Information Center
Pueblo, CO 81002

Phone: 303/544-5277, Ext. 370

- Consumer Information Catalog

SOLAR ENERGY INDUSTRIES ASSOCIATION

Address: Solar Energy Industries Association
1001 Connecticut Avenue, NW
Suite 800
Washington, DC 20036

Phone: 202/293-2981

- Seminars and Trade Shows
- Education
- Legislative Updates
- Newsletters

SOLAR ENERGY RESEARCH INSTITUTE

Address: Solar Energy Research Institute
Information Center
1617 Cole Boulevard
Golden, CO 80401

Phone: 303/231-1000

- Information on Solar Technologies (Photovoltaics, Biomass, Wind, Solar Thermal, Industrial Process Heat)
- Alcohol Fuels Information Center (1-800/525-5555)
- Solar Energy Information Data Bank (SEIDB)
- Solar Energy Information Locator Booklet

SPELLING

ACTIVITY 1

Directions: There are twenty five (25) spelling errors in the paragraph below. Proofread the sentences and circle the errors. Rewrite the paragraph correctly.

Four several reasons it is important too bee able two store energy. Won good reason is that it can than be kept for latter use. The energy gathered form the wend by a wendmill, for instance, can be used onley whil the wend is blowing, unless it is storeed in som way. Another reason is that wen energy is storeed in matter it can be shiped easily from one plase to another. A third reason for storeing energy is that it can thin be carried with us wen non is available along the way.

ACTIVITY 2

Directions: Choose the correctly spelled word in each group of words below. Use it to complete the blank with the same number in the paragraph.

- | | | | | |
|----------|-----------|----------|-------------|------------|
| 1. gas | 2. step | 3. stopp | 4. wasteing | 5. Inog |
| gas | steep | stop | waisting | long |
| gaas | stepp | stope | wasting | logn |
| 6. we'll | 7. saving | 8. helth | 9. wil | 10. people |
| w'ell | saveing | healt | will | peeple |
| wel'l | savving | health | wile | peopel |

Let's decrease our dependence on oil and natural (1) _____ and all other polluting energy sources. Let's (2) _____ up research on solar and other clean forms of energy. In the meantime, let's (3) _____ (4) _____ energy and clean up our energy-producing process. In the (5) _____ run, (6) _____ be (7) _____ our environment and our (8) _____. That (9) _____ be good for (10) _____ and our natural heritage.

ACTIVITY 3

Directions: Follow the instructions for Activity 2.

- | | | | |
|-------------------------------------|--|---|---|
| 1. scale
scael
scal | 2. conservashun
conserevation
conservation | 3. hiways
highways
hihgways | 4. mass
mas
mase |
| 5. sistems
systums
systems | 6. provid
provide
porvide | 7. shopping
shopeing
shoping | 8. araes
areas
aereas |
| 9. destance
distance
distance | 10. gasoline
gassoline
gasaline | 11. unnecessary
unnecessary
unnesessary | 12. packageing
pakaging
packaging |
| 13. porduc
porduce
produce | 14. solid
sollid
sollid | 15. feul
fuel
fule | |

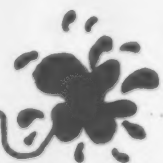
On a large (1) _____, we can promote
 (2) _____. One way is by building fewer (3) _____
 and more (4) _____ transit (5) _____ which
 use energy more efficiently. We can plan cities that (6) _____
 (7) _____ (8) _____ within walking
 (9) _____ of most homes, thus reducing the need to
 waste (10) _____ in driving to shops. We can ban, or
 curb, (11) _____ (12) _____ that takes a lot
 of energy to (13) _____ and often ends up as litter
 anyway. We can recycle (14) _____ wastes and use them
 to supply more (15) _____.

USING LEGIBLE CURSIVE HANDWRITING

Listed below are some directions to follow when you are writing paragraphs and compositions. Study them carefully and use them in your written work.

1. Use 21.6 x 27.9 cm ruled composition (notebook) paper and write on only one side of the sheet.
2. Follow your teacher's instructions about the placement of your name, class, and date in the heading of your papers.
3. Write the title of a story in the center of the first blue line. Do not enclose the title in quotation marks. Skip a line between the title and the first line of writing.
4. Leave two full spaces for a bottom margin; leave about 2.5 cm for a right margin.
5. Keep both side margins as straight as possible. (Most ruled paper has a red line on the left side to help you do this.)
6. Indent the first line of each paragraph about 1.5 cm from the left margin line.
7. If the written work is more than one page in length, number all pages after the first page (which is not numbered) by placing the correct number in the center about 1.5 cm down from the top of the paper. If your teacher requires your name on all pages, the page number may be placed directly under your name.
8. Write legibly and neatly. Form your letters carefully so that one letter is not mistaken for another. Dot i's and cross t's. If you must erase, do it neatly.

Notice the Alphabet Chart and Writing Checklist forms that follow. The letters of the alphabet are written in the correct size for work written on standard notebook paper.

Solar Sun 

ALPHABET CHART

A B C D E F G H I J K L M N O P Q
R S T U V W X Y Z

a b c d e f g h i j k l m n
o p q r s t u v w x y z

WRITING CHECKLIST

DIRECTIONS FOLLOWED	YES	NO
1. Writing on one side only of ruled paper.		
2. Name, class, and date in correct place.		
3. Titled centered on top line.		
4. Line skipped after title.		
5. Margins kept on all sides and bottom, with left margin straight.		
6. First line of each paragraph indented.		
7. Pages after first page numbered correctly.		
8. Writing is legible. (If your answer is "No", list on your paper the words or letters you feel are the least legible. Practice these, using the Alphabet Chart.)		

ACTIVITY 1

Directions: Copy the following poem about the sun using the Alphabet Chart to check the formation of your letters. Use your best handwriting. Remember to copy neatly each word and mark of punctuation.

THE SUN

I told the Sun that I was glad,
I'm sure I don't know why;
Somehow the pleasant way he had
Of shining in the sky
Just put a notion in my head
That wouldn't it be fun
If, walking on the hill, I said
"I'm happy" to the Sun.

John Drinkwater

ACTIVITY 2

Directions: Copy the story below on your own paper, using the rules given for written work.

NATURAL GAS

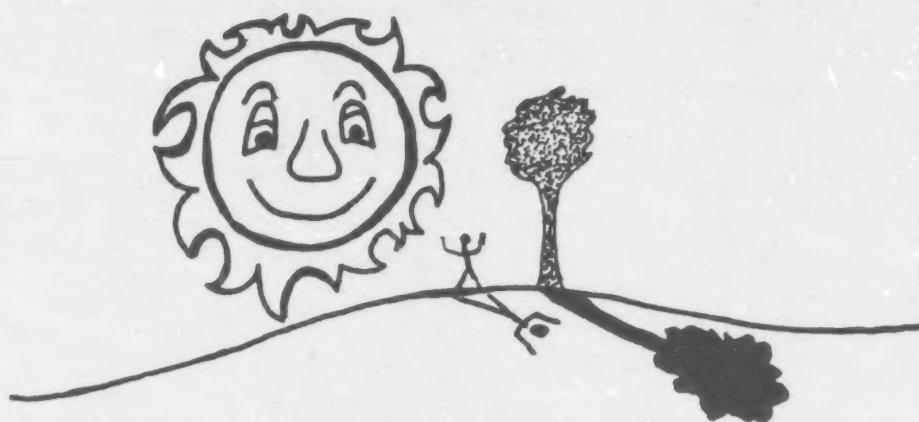
William Hart, a young gunsmith, was fascinated by the bubbles of gas rising from a creek near his home in Fredonia, New York. Sometimes the bubbles seemed to burn. In 1821, Hart built a small well above this "burning spring", as his neighbors called it. Within four years, his well supplied enough gas to light several nearby shops. Hart's curiosity led to the start of the natural gas industry.

ACTIVITY 3

Directions: Now evaluate what you have written in Activity 2. On your own paper, answer the questions given on the Writing Checklist to check how well you have written.

ACTIVITY 4

Directions: Exchange your Activity 3 composition with another student. Study the other student's composition. Then, on your own paper, answer the eight questions on the Writing Checklist about the other student's composition. Discuss with each other the good points and the things that need improvement.



PUNCTUATION

Period and Question Mark

Use a period or question mark to punctuate simple declarative or interrogative sentences, respectively.

1. We get energy from many sources. (Declarative - .)
2. What would our lives be like without electricity? (Interrogative -?)

ACTIVITY 1

Directions: Punctuate the following sentences with the appropriate mark.

1. Our oceans could provide us with new energy sources .
2. Some scientists believe that we can generate electricity from ocean currents
3. What can we do to prevent the depletion of our remaining fuel reserves
4. We must find new energy sources
5. Where can significant cutbacks in energy use be made
6. It seems obvious that leisure time activities drain heavily on our precious fuel reserves

Titles

Use a period to complete abbreviations of common titles used as proper nouns.

Examples: Mr., Mrs., Dr.

ACTIVITY 2

Directions: Punctuate the titles in the following sentences:

1. Mrs Carrie Sandusky is an environmentalist.
2. The author of "Stop Taking Us for Fools" is Mr Charlie Simmons, an average American.
3. Dr Carol Fisher has a degree in nuclear physics.
4. Gov Bob Graham approved the energy grant.
5. Col Robert Lewis of the U S Navy toured the Solar Energy Center.

CONTRACTIONS

Use an apostrophe to form contractions. Examples: cannot = can't

ACTIVITY 3

Directions: Punctuate the contractions underlined in the following sentences:

1. Lets decrease our dependence on oil and natural gas.
2. If we dont stop the pollution of our air, water, and land, the costs will be great.
3. In the long run well be saving our environment and our health.
4. Im afraid weve waited too long to reverse this energy crisis.
5. Isnt it true that well all have to conserve energy?

COMMA IN A SERIES

Use the comma to separate words in a series. Example: Single word series

Before we had electricity we burned coal, oil, and wood.

Example: Several word series

Fossil fuels are fuels such as coal, crude oil, or natural gas.

ACTIVITY 4

Directions: Write the letter and the correctly punctuated sentence from each pair of sentences below.

1. A. Airplanes use wind for take-off landing, and flight.
B. Airplanes use wind for take-off, landing, and flight.
2. A. Natural gas is clean, convenient to use, and cheap.
B. Natural gas is clean convenient to use and cheap.
3. A. Most of the natural gas in the U.S. can be found in Texas, Louisiana, Alaska, Oklahoma, and New Mexico.
B. Most of the natural gas in the U.S. can be found in Texas Louisiana Alaska Oklahoma and New Mexico.
4. A. Americans became dependent on electricity in the 1960's when they bought electric blankets electric shoe shiners electric mixers, etc.
B. Americans became dependent on electricity in the 1960's when they bought electric blankets, electric shoe shiners, electric mixers, etc.

COMMA IN DIRECT ADDRESS

Use a comma to set off proper names in direct address. **DIRECT ADDRESS** is speaking to a person, calling him or her by name or "title."

Example: John, what do you do to conserve energy?

ACTIVITY 5

Directions: Place commas where they are needed in the following sentences.

1. How do we change kelp into oil Dr. Bogan?
2. Jill have you met Dr. Richard H. Bogan of the National Science Foundation?
3. Dr. Bogan believes Jill that the big problems in changing kelp into oil is getting enough seaweed.
4. Bill please check these figures on oil consumption in the United States.
5. Dr. LaHart please tell us how to build a passive solar water heater.

APOSTROPHE IN POSSESSIVE

Use an apostrophe and "s" to show the possessive (ownership) of singular and plural nouns which do not end in s.

Examples: The President's energy plan is working. (Singular Noun)

Sheep's wool may not always be available for clothing material. (Plural Noun)

ACTIVITY 6

Directions: Choose the word that correctly completes the sentence.

1. A generally accepted theory says that the _____ energy comes from an enormous hydrogen reaction.
A. suns B. sun' C. suns' D. sun's
2. Seventy percent of all _____ clothing is made from petrochemicals.
A. women's B. women C. womens' D. woman's
3. _____ climate is ideal for using solar heating of pools.
A. Floridas' B. Florida's C. Floridas' D. Floridas
4. Water heating represents our _____ oldest use of solar energy.
A. state's B. states C. states' D. states
5. The _____ parents insist that they always turn off lights when not in use.
A. children B. children's C. childrens' D. childrens

CAPITALIZATION

Capitalize the first letter of the first word of a sentence, the pronoun "I", and the first letters in the names of persons.

- Examples:
1. Atomic energy began long ago. (First word of a sentence.)
 2. I enjoy studying atomic history. (The pronoun "I".)
 3. Democritus was one of our first atomic thinkers. (The first letter in the name of a person.)

ACTIVITY 1

Directions: Draw a circle around the letter of the word or words which should be capitalized in each sentence.

1. our first atomic thinker was democritus.
2. he decided everything must be composed of atoms of one kind or another.
3. aristotle advanced the theory that everything is composed of earth, water, air, and fire.
4. in 1808 in England, John dalton developed the atomic theory of matter as a firm principle rather than just a philosophical guess.
5. i believe two of the most well-known developers of atomic energy were pierre and marie curie.
6. they isolated radium by refining huge quantities of pitchblende, an ore of uranium.
7. dr. david LaHart works at the Florida Solar Energy Center.

Capitalize common titles (Mr., Mrs., Dr.), days of the week, month of the year, and names of streets, cities, states, and countries.

- Examples:
1. Titles - Sir Joseph John Thompson used cathode ray experiments to prove the existence of tiny particles or electrodes.
 2. Days of the week and months of the year - The first Sunday of May was declared Solar Sunday.
 3. Names of streets, cities, states, and countries - The address of the Florida Solar Energy Center is 300 State Road 401, Cape Canaveral, Florida, United States of America.

ACTIVITY 2

Directions: Choose the answer that should begin with a capital letter.

1. The theory of relativity was discovered by doctor Albert Einstein.
 - A. theory
 - B. relativity
 - C. doctor
2. Niels Bohr of denmark worked out a mathematical explanation for the probable structure of the atom.
 - A. denmark
 - B. mathematical
 - C. atom
3. The first atomic bomb was exploded in new mexico on July 15, 1945.
 - A. atomic bomb
 - B. new mexico
 - C. exploded
4. All students will begin studying solar energy on september 18, 1981.
 - A. energy
 - B. solar
 - C. september
 - D. none of the above
5. In the 1900's, Eastern Sun Power Company of cairo, Egypt, built the world's largest solar power plant.
 - A. cairo
 - B. solar
 - C. plant
 - D. all of the above

Capitalize commonly used abbreviations for proper nouns. A proper noun is the name of a particular person, place, or thing. Proper nouns are ALWAYS capitalized. Abbreviations for proper nouns are ALWAYS capitalized.

Examples:

Mister	-	Mr.
Mistress	-	Mrs.
Street	-	St.
Road	-	Rd.
Drive	-	Dr.
Junior	-	Jr.
Senior	-	Sr.



Two Letter Postal Abbreviations for States:

AL	Alabama	MO	Missouri
AK	Alaska	MT	Montana
AZ	Arizona	NE	Nebraska
AR	Arkansas	NV	Nevada
CA	California	NH	New Hampshire
CZ	Canal Zone	NJ	New Jersey
CO	Colorado	NM	New Mexico
CT	Connecticut	NY	New York
DE	Delaware	NC	North Carolina
DC	District of Columbia	ND	North Dakota
FL	Florida	OH	Ohio
GA	Georgia	OK	Oklahoma
GU	Guam	OR	Oregon
HI	Hawaii	PA	Pennsylvania
ID	Idaho	PR	Puerto Rico
IL	Illinois	RI	Rhode Island
IN	Indiana	SC	South Carolina
IA	Iowa	SD	South Dakota
KS	Kansas	TN	Tennessee
KT	Kentucky	TX	Texas
LA	Louisiana	UT	Utah
ME	Maine	VT	Vermont
MD	Maryland	VA	Virginia
MA	Massachusetts	VI	Virgin Islands
MI	Michigan	WA	Washington
MN	Minnesota	WV	West Virginia
MS	Mississippi	WI	Wisconsin

ACTIVITY 3

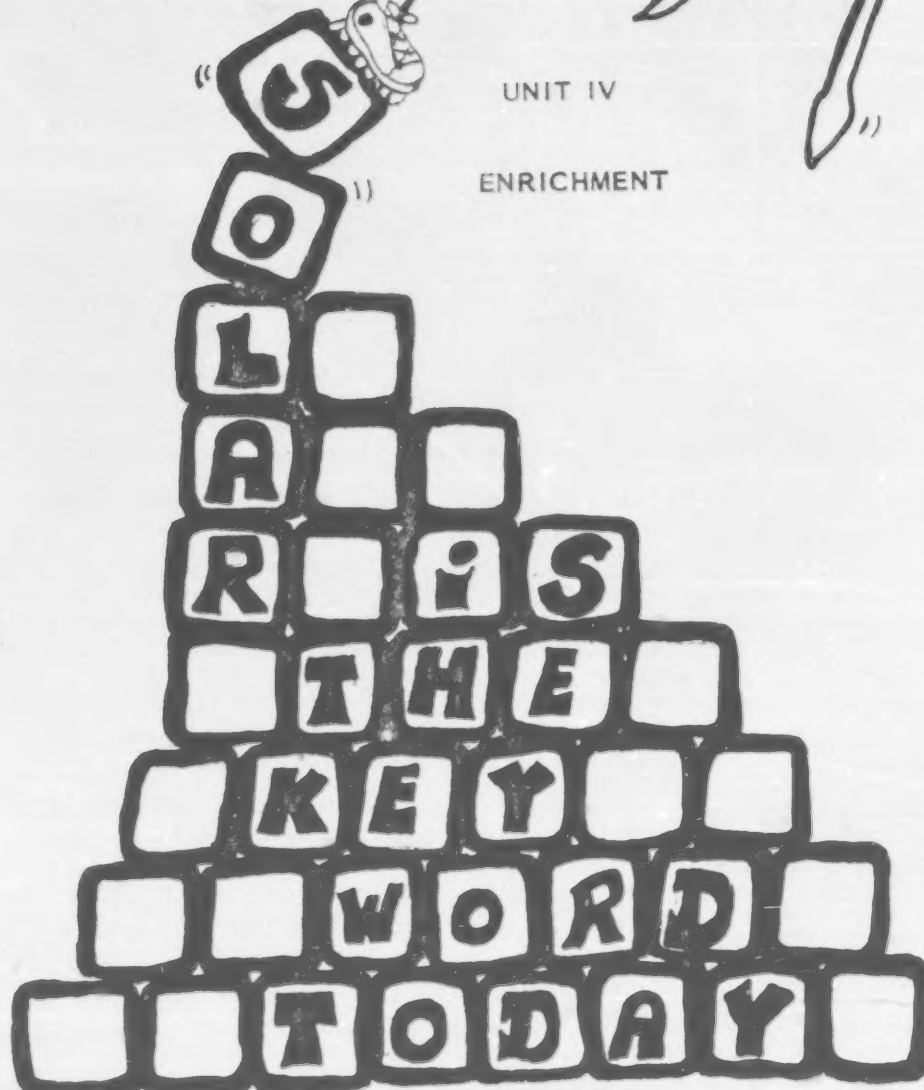
Directions: Choose the answer that means the same as the underlined abbreviation.

- The sign said, "Solar Sunday, Jan. 11."
 - June
 - July
 - January
 - Junior
- Please address your request to National Solar Heating Center, P. O. Box 1607, Rockville, MD 20950.
 - Maryville
 - Maryland
 - Mississippi
 - Maine
- The second part of the address is P.O. Box 1607.
 - Post Haste
 - Post Office
 - Portland, Oregon
 - Puerto Rico
- Dr. Marcy Hart wrote an interesting article on energy.
 - Artist
 - Doctor
 - Student
 - Business man
- President Reagan signed the energy bill in Washington, DC.
 - District of Columbia
 - Delaware
 - Canal Zone
 - District, California
- The Environmental Study Center is near Oviedo, FL.
 - Florida
 - Frankfort, Kentucky
 - Freeport, Virginia
 - State



UNIT IV

ENRICHMENT



In classical mythology there are many stories of mortals who attempt too much, who try to rival the powers of the gods and goddesses. This is the story of a boy who for a few moments "felt himself the lord of the sky."

PHAETHON

The palace of the Sun was a radiant place. It shone with gold and gleamed with ivory and sparkled with jewels. Everything without and within flashed and glowed and glittered. It was always high noon there. Shadowy twilight never dimmed the brightness. Darkness and night were unknown. Few among mortals could have long endured that unchanging brilliancy of light, but few had ever found their way thither.

Nevertheless, one day a youth, mortal on his mother's side, dared to approach. Often he had to pause and clear his dazzled eyes, but the errand which had brought him was so urgent that his purpose held fast and he pressed on, up to the palace, through the burnished doors, and into the throne room where surrounded by a blinding, blazing splendor the Sun god sat. There the lad was forced to halt. He could bear no more.

Nothing escapes the eyes of the Sun. He saw the boy instantly and looked at him very kindly. "What brought you here?" he asked.

"I have come," the other answered boldly, "to find out if you are my father or not. My mother said you were, but the boys at school laugh when I tell them I am your son. They will not believe me. I told my mother and she said I had better go and ask you."

Smiling, the Sun took off his crown of burning light so that the lad could look at him without distress. "Come here, Phaethon," he said. "You are my son. Clymene told you the truth. I expect you will not doubt my word too? But I will give you a proof. Ask anything you want of me and you shall have it. I call the Styx to be witness to my promise, the river of the oath of the gods."

No doubt Phaethon had often watched the Sun riding through the heavens and had told himself with a feeling, half awe, half excitement, "It is my father up there." And then he would wonder what it would be like to be in that chariot, guiding the steeds along that dizzy course, giving light to the world. Now at his father's words this wild dream had become possible. Instantly he cried, "I choose to take your place, Father. That is the only thing I want. Just for a day, a single day, let me have your car to drive."

The Sun realized his own folly. Why had he taken that fatal oath and bound himself to give in to anything that happened to enter a boy's rash young head? "Dear lad," he said, "this is the only thing I would have refused you. I know I cannot refuse. I have sworn by the Styx. I must yield if you persist. But I do not believe you will. Listen while I tell you what this is you want. You are Clymene's son as well as mine. You are mortal and no mortal could drive my chariot. Indeed, no god except myself can do that. The ruler of the gods cannot. Consider the road. It rises up from the sea so steeply that the horses can hardly climb it, fresh though they are in the early morning. In mid-heaven it is so high that even I do not like to look down. Worst of all is the descent, so precipitous that the sea gods waiting to receive me wonder how I can avoid falling headlong. To guide the horses, too, is a perpetual struggle. Their fiery spirits grow hotter as they climb and they scarcely suffer my control. What would they do with you?

"Are you fancying that there are all sorts of wonders up there, cities of the gods full of beautiful things? Nothing of the kind. You will have to pass beasts, fierce beasts of prey, and they are all that you will see. The Bull, the Lion, the Scorpion, the great Crab, each will try to harm you. Be persuaded. Look around you. See all the goods the rich world holds. Choose from them your heart's desire and it shall be yours. If what you want is to be proved my son, my fears for you are proof enough that I am your father."

But none of all this wise talk meant anything to the boy. A glorious prospect opened before him. He saw himself proudly standing in that wondrous car, his hands triumphantly guiding those steeds which Jove himself could not master. He did not give a thought to the dangers his father detailed. He felt not a quiver of fear, not a doubt of his own powers. At last the Sun gave up trying to dissuade him. It was hopeless, as he saw. Besides, there was no time. The moment for starting was at hand. Already the gates of the east glowed purple, and Dawn had opened her courts full of rosy light. The stars were leaving the sky; even the lingering morning star was dim.

There was need for haste, but all was ready. The Seasons, the gatekeepers of Olympus, stood waiting to fling the doors wide. The horses had been bridled and yoked to the car. Proudly and joyously Phaethon mounted it and they were off. He had made his choice. Whatever came of it he could not change now. Not that he wanted to in the first exhilarating rush through the air, so swift that the East Wind was outstripped and left far behind. The horses' flying feet went through the low-banked clouds near the ocean and through a thin sea mist and then up and up in the clear air, climbing the height of heaven. For a few ecstatic moments Phaethon felt himself the lord of the sky. But suddenly there was a change. The chariot was swinging wildly to and fro; the pace was faster; he had lost control. Not he, but the horses were directing the course. That light weight in the car, those feeble hands clutching the reins, had told them their own driver was not there. They left the road and rushed where they chose, up, down, to the right, to the left. They nearly wrecked the chariot against the Scorpion; they brought up short and almost ran into the Crab. By this time the poor charioteer was half fainting with terror, and he let the reins fall.

That was the signal for still more mad and reckless running. The horses soared up to the very top of the sky and then, plunging headlong down, they set the world on fire. The highest mountains were the first to burn, Ida and Helicon, where the Muses dwell, Parnassus, and heaven-piercing Olympus. Down their slopes the flame ran to the low-lying valleys and the dark forest lands, until all things everywhere were ablaze. The springs turned into steam; the rivers shrank. It is said that it was then the Nile fled and hid his head, which still is hidden.

In the car Phaethon, hardly keeping his place there, was wrapped in thick smoke and heat as if from a fiery furnace. He wanted nothing except to have this torment and terror ended. He would have welcomed death. Mother Earth, too, could bear no more. She uttered a great cry which reached up to the gods. Looking down from Olympus they saw that they must act quickly if the world was to be saved. Jove seized his thunderbolt and hurled it at the rash, repentant driver. It struck him dead, shattered the chariot, and made the maddened horses rush down into the sea.

Phaethon, all on fire, fell from the car through the air to the earth. The mysterious river Eridanus, which no mortal eyes have ever seen, received him and put out the flames and cooled the body. The naiads, in pity for him, so bold and so young to die, buried him and carved upon the tomb:

Here Phaethon lies who drove the sun god's car.
Greatly he failed, but he had greatly dared.

His sisters, the Heliades, the daughters of Helios,
The Sun, came to his grave to mourn for him.
There they were turned into poplar trees,
on the bank of the Eridanus,

Where sorrowing they weep into the stream forever.
And each tear as it falls shines in the water,
A glistening drop of amber.

"Phaethon" from MYTHOLOGY by Edith Hamilton. Copyright 1942 by Edith Hamilton. Copyright (c) renewed 1969 by Dorain Fielding Reid and Doris Fielding Reid, Executrix of the Will of Edith Hamilton. Reprinted by permission of Little, Brown & Co.

SEEKING MEANING

1. According to this myth, what explanation did the ancient Greeks have for the rising and setting of the sun?
2. Why did Phaethon want to drive his father's chariot?
3. Why was Helios forced to keep his promise to Phaethon? What arguments did he use in an attempt to change his son's mind? Why was he unsuccessful?
4. What happened to the earth when Phaethon lost control of the chariot?
5. What scientific concepts about the sun and its power are illustrated by this story? What misconceptions about the sun did the Greeks have?
6. The inscription carved on Phaethon's tomb read: "Greatly he failed, but he had greatly dared." Was Phaethon's adventure an act of great daring or great folly? Explain your answer.

DEVELOPING VOCABULARY

Find the meanings of these words and use each in a sentence.

thither

awe

precipitous

perpetual

dissuade

exhilarating

ecstatic

repentant

DEVELOPING SKILLS OF EXPRESSION

1. Reread the first paragraph of Phaethon.

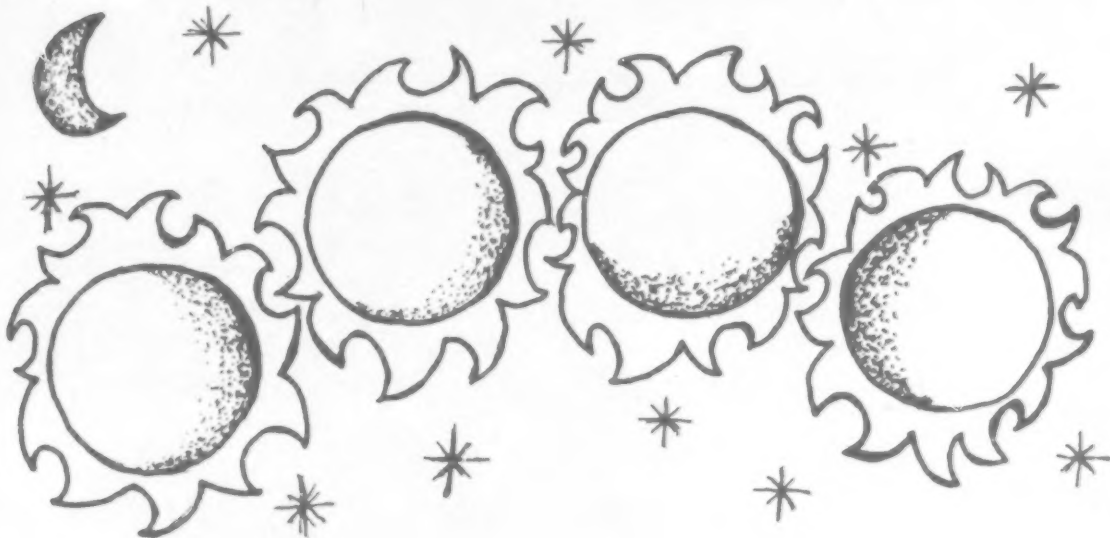
What is the author doing in this paragraph?

List the adjectives; explain why the presence of the Sun would be described this way.

2. Write a paragraph describing your entrance into the palace of the Moon. Remember that moonlight is only reflected sunlight.
3. A photon is the part of solar energy that causes the photovoltaic effect.

Write a myth about a photon that enters a solar cell and releases a "trapped" electron.

Should your myth have a happy or tragic ending?



ICARUS AND DAEDALUS

Among all those mortals who grew so wise that they learned the secrets of the gods, none was more cunning than Daedalus.

He once built, for King Minos of Crete, a wonderful Labyrinth of winding ways so cunningly tangled up and twisted around that, once inside, you could never find your way out again without a magic clue. But the King's favor veered with the wind, and one day he had his master architect imprisoned in a tower. Daedalus managed to escape from his cell; but it seemed impossible to leave the island, since every ship that came or went was well guarded by order of the King.

At length, watching the sea gulls in the air - the only creatures that were sure of liberty - he thought of a plan for himself and his young son Icarus, who was captive with him.

Little by little, he gathered a store of feathers great and small. He fastened these together with thread, molded them in with wax, and so fashioned two great wings like those of a bird. When they were done, Daedalus fitted them to his own shoulders, and after one or two efforts, he found that by waving his arms he could winnow the air and cleave it as a swimmer does the sea. He held himself aloft, wavered this way and that with the wind, and at last, like a great fledgling, he learned to fly.

Without delay, he fell to work on a pair of wings for the boy Icarus and taught him carefully how to use them, bidding him beware of rash adventures among the stars. "Remember," said the father, "never to fly very low or very high, for the fogs about the earth would weigh you down, but the blaze of the sun will surely melt your feathers apart if you go too near."

For Icarus, these cautions went in at one ear and out by the other. Who could remember to be careful when he was to fly for the first time? Are birds careful? Not they! And not an idea remained in the boy's head but the one joy of escape.

The day came, and the fair wind that was to set them free. The father-bird put on his wings, and, while the light urged them to be gone, he waited to see that all was well with Icarus, for the two could not fly hand in hand. Up they rose, the boy after his father. The hateful ground of Crete sank beneath them; and the country folk, who caught a glimpse of them when they were high above the treetops, took it for a vision of the gods - Apollo, perhaps, with Cupid after them.

At first there was a terror in the joy. The wide vacancy of the air dazed them - a glance downward made their brains reel. But when a great wind filled their wings, and Icarus felt himself sustained, like a halcyon bird in the hollow of a wave, like a child uplifted by his mother, he forgot everything in the world but joy. He forgot Crete and the other islands that he had passed over: he saw but vaguely that winged thing in the distance before him that was his father Daedalus. He longed for one draft of flight to quench the thirst of his captivity: he stretched out his arms to the sky and made toward the highest heavens.

Alas for him! Warmer and warmer grew the air. Those arms, that had seemed to uphold him, relaxed. His wings wavered, dropped. He fluttered his young hands vainly - he was falling - and in that terror he remembered. The heat of the sun had melted the wax from his wings; the feathers were falling, one by one, like snowflakes; and there was none to help.

He fell like a leaf tossed down by the wind, down, down, with one cry that overtook Daedalus far away. When he returned and sought high and low for the poor boy, he saw nothing but the bird-like feathers afloat on the water, and he knew that Icarus was drowned.

The nearest island he named Icaria, in memory of the child; but he, in heavy grief went to the temple of Apollo in Sicily and there hung up his wings as an offering. Never again did he attempt to fly.

From OLD GREEK FOLK TALES by Josephine Preston Peabody.
Published by Houghton Mifflin Company. Reprinted by permission.

SEEKING MEANING

1. At the opening of the myth, you are told that Daedalus was so cunning that he learned the secrets of the gods. Do you think he was punished for his knowledge? Explain your answer.
2. Both Icarus and Phaethon fell from the sky to their deaths. Compare them. How are they alike, and how are they different?
3. Myths often show what attitudes and behavior are expected from human beings. What lesson might have been drawn from the myth of Icarus and Daedalus about obedience to the laws of nature? About obedience of young people to their elders?
4. Near the end of this myth, the author describes Icarus going higher and higher in the sky. "Warmer and warmer grew the air." Does the air get warmer as you move away from the surface of the earth? Use your knowledge about the earth's atmosphere to explain your answer.

DEVELOPING VOCABULARY

Find the meaning of these words and use each in a sentence:

cunning

veered

architect

liberty

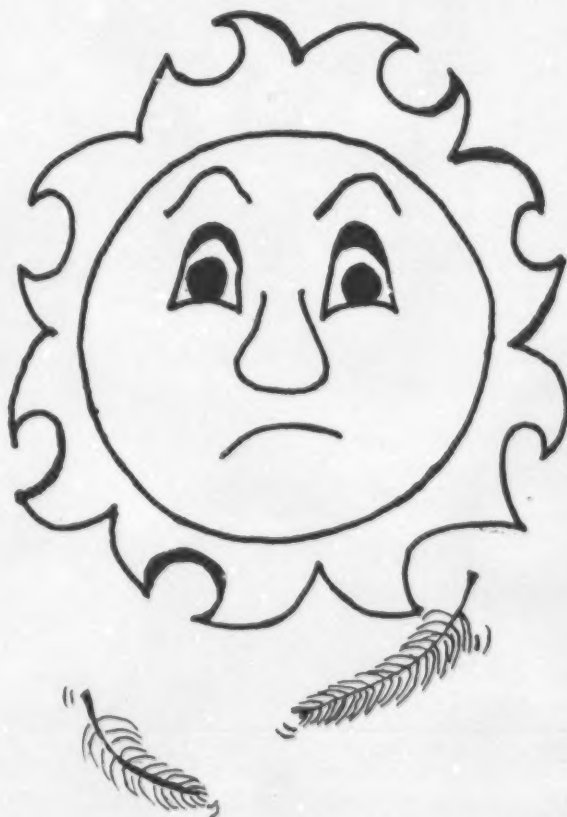
winnow

fledgling

DEVELOPING SKILLS OF EXPRESSION

1. The Labyrinth is described as "a wonderful Labyrinth of winding ways so cunningly tangled up and twisted around..." Write a sentence that describes something in your school without actually naming it. Take turns sharing your descriptions and trying to guess what is actually the subject of the sentence.
2. Write sentences describing one of the devices designed to use solar energy that is listed below. If you don't understand the device, check with the librarian.

photovoltaic cell
parabolic mirror
Ocean Thermal Energy
clothes line
flat plate collector
evacuated tubes
skylights
methane generator
windmill
heliostats
sailboat
biomass



THE FLAMING GOD

By Isaac Asimov

Greek and Norseman, Aztec and Egyptian, all prayed to a sun-god, mythology's deity, without whom no human could live.

If you were a primitive person waiting through a long night; if it were dark and chilly, with no source of light and heat but perhaps a smoldering campfire; if you could hear the rustling noises that might mean predatory animals that could see far better in the dark than you could; if you could sleep no more - what would be the greatest sight?

It would have to be the soft graying of the sky in the east, the brightening of the dawn, which brought the sure promise that, in a short while, poking above the horizon, would come the sun itself, to make the world light and warm and secure again.

In those days, when the workings of the universe were attributed to myriad gods, surely among the chief of them would have to be a sun-god, powerful and beneficent, for how could human beings live without the sun? God's first command in the Bible was "Let there be light" (to be collected into sun, moon, and stars on the fourth day), for without light nothing else was possible.

To the ancient Egyptians, the sun-god was Re, and he was the principle of creation, creator of everything, even of himself. Each Egyptian city had its own god, often equated with the sun-god. When the Egyptian empire was at its height, about 1500 B.C., with its capital the southern city of Thebes, the god of that city, Amon, became Amon-Re, god of Thebes and of the sun.

Then, about 1360 B.C., when for the first time in history, as far as we know, a monotheistic religion was established briefly under Pharaoh Ikhnoton, of Egypt, the one supreme god he worshiped was the god of the sun.

The equally old Babylonian civilizations had a sun-god called Shamash, the giver of life and light, and the father of law and justice. And why not? It's natural even today to equate law and justice with the light of the sun and to feel that the cloak of darkness hides evil and crime.

Every civilization had its sun-god among the great powers of the pantheon. India had the redheaded Surya, from whom the race of human beings was descended. Japan had Amaterasu (unusual in being a sun-goddess), and if she was not the ancestress of the human species, she was at least the progenitor of the Japanese ruling house, of which Hirohito is the current representative.

The Norse had the beautiful Balder, god of the sun, of youth, and of beauty, who was married to Nanna, goddess of the moon. And so it goes: the ancient Irish had Lugh; the ancient Britons, Lleu; the ancient Slavs, Dazhbog who was also the god of wealth and success - undoubtedly because of the sun's golden appearance; the Polynesians, Tane, who was also the god for all living things; the Maya, Itzamna, the sun-god who was the first, the oldest, and the creator of all else; the Aztecs, Quetzalcoatl, a sun-god who was also the god of wisdom and the inventor of the calendar.

In the West, however, the best-known sun-god is the Greek Helios, who was later identified with Apollo. Whereas the Egyptian sun-god, Re, crossed the sky in a boat, Helios crossed it in a magnificent golden chariot drawn by four fiery horses that only he could control.

The difficulty of keeping those raging steeds on their course was the thought that gave rise in Western literature to what is perhaps the best-known myth involving the sun-god. Helios had a son, Phaethon, by the nymph Clymene. When doubts were cast on his paternity, Phaethon went to Helios and insisted that the god vow to vindicate his son's honor. Helios vowed, and Phaethon demanded to be put in charge of the solar chariot for a day.

Helios was forced to give in, and Phaethon took the controls. Feeling an inept hand on the reins, the horses went out of control. Rearing and plunging, they came too close to earth, burned a desert across northern Africa, and baked the African people black. The earth would have been destroyed if the Greek master god, Zeus, had not struck Phaethon out of the chariot with lightning and allowed the horses to return of their own accord to their accustomed path.

The normal path of the sun is itself a matter of adventure. To help use the sun and moon as bases for timekeeping, the ancient Sumerians (the earliest civilization in the Tigris-Euphrates Valley) were the first to mark off the stars into those groups we now call constellations, and they gave them fanciful names based on resemblances of the distant star configurations to familiar objects. The sun, in the course of the year, passed through twelve constellations of the zodiac, called after the names of lions, crabs, and archers.

The tale of the sun's journey would recount his victory over each danger he encountered, and the suspense would be great, for only by his victory could his course be successfully completed and human survival assured. It may be that the twelve labors that Hercules must successfully complete before achieving rest in heaven is a version of the sun's passage through the twelve dangerous constellations - a version obscured by changes in the names of the constellations and by accretions of incidents by ancient mythmakers.

Yet the sun's career is not one of unalloyed success. However triumphant he may be ordinarily, he can be obscured by clouds. In those parts of Europe where clouds and storms are common, it may be the lightning-wielding god of the sky or of storms who is supreme - the Zeus of the Greeks and the Thor of the Norse. Even the Bible seems to depict Yahweh as having been a storm-god in primitive times.

There is also the danger of eclipse, which temporarily seems to slay, in part or in whole, either the sun or the moon. In the Norse myths both the sun and the moon are eternally pursued by gigantic wolves as they make their way across the sky, and occasionally the wolves overtake the luminaries and hide them, temporarily, within their slaving jaws.

But the storm cloud appears only occasionally, and the eclipse is even more rare. One solar death, however, is periodic and inevitable. At the close of each day, the sun, no matter how glorious its reign, must sink beneath the western horizon, defeated and bloody, and night returns in victory.

This is represented most colorfully in the Norse tale of their sun-god, Balder. Balder, the joy of gods and humanity, is troubled suddenly by a presentiment of death. His mother, Frigg (the wife of the Norse master god, Odin), exacts an oath from all things to do no harm to Balder but neglects to include the mistletoe. The gods then engage in the game of hurling missiles at Balder in order to watch those missiles swerve away of their own accord.

The evil god of fire, Loki, learning of the exemption of the mistletoe, carves a mistletoe branch into a spear and gives it to Hoder, the god of night, who being blind (after all, one cannot see by night), has not been participating in the game. Loki guides Hoder's aim and Balder falls. The sun had died under the attack of night.

A less obvious solar myth may be the Hebrew legend of Samson. The Hebrew version of the name, Shimshon, bears a striking resemblance to shemesh, the Hebrew word for "Sun" (itself related to the Babylonian Shamash). Two miles south of Samson's traditional birthplace was the town of Beth-shemesh ("house of the sun"), believed to have been a center of sun worship.

Samson, like Hercules, survives various dangers because of his superhuman strength. What's more, Samson's strength derives from his hair, which may be viewed as representing the golden rays of the midday sun. When Samson's hair is shorn, he grows weak, as does the sun when it approaches the horizon, red and rayless, so that it can be looked on without harm. It is in the lap of Delilah that Samson sleeps when he is shorn, and Delilah's name is closely akin to the Hebrew lilah, meaning "night." The sun sinks into the lap of night and is defeated and blinded. But Samson's hair grows again and he recovers his strength for one last feat, since, after all, the sun does rise the next morning.

In fact, in the sunny lands particularly, the sun must survive all the onslaughts of night and must win in the end. In Persian mythology Ahura Mazda, the god of light, fights Ahriman, the god of darkness, in a cosmic battle that fills the universe - and it is Ahura Mazda who will win at the end of time. (The Jews of the Persian period adopted this view, and it is from 400 B.C. onward that Satan enters the Judaic, and later the Christian, consciousness as the dark adversary of God, to be defeated at the end.)

The sun's setting and rising is one inspiration for the many mythic tales involving the death and resurrection of a god. An even more impressive death and resurrection is the death of vegetation with the coming of winter and its restoration in the spring.

The tale of Balder might just as well be the symbol of the god of summer's being slain by the god of winter. Similar significance can be given to the death and resurrection of Osiris among the Egyptians, of Thammuz among the Babylonians, and of Proserpine among the Greeks.

But the sun is clearly connected with the summer-winter cycle as well as with the day-night cycle. Throughout the European summer, the noonday sun reaches a slightly lower point in the southern sky each day than it did the day before. As the sun's path in the sky slowly sinks southward, the temperature grows colder and the vegetation turns brown and dies.

If the sun should continue to sink and should pass down behind the southern horizon altogether, death would be universal and permanent, but that does not happen. The rate of sinking slows, and each year on December 21, by our calendar, the sun comes to a halt - solstice (from the Latin solstitium, "sun half") - and thereafter beings to rise again.

The winter may continue to sharpen after the solstice, but the fact that the noonday sun rises steadily higher in the sky is a guarantee that spring and summer will come once more. The day of the winter solstice, of the birth of a new summer sun, is therefore a time for a great festival, celebrating the rescue of all life.

The most familiar solstice celebration of ancient times was that of the Romans. The Romans believed that their agricultural god, Saturn, ruled Italy during an early golden age of rich crops and plentiful food. The winter solstice, then, with its promise of a return of summer and of the golden time of Saturnian agriculture, was celebrated with a week-long Saturnalia from December 17 to 24. It was a time of unrelieved merriment and joy. Businesses closed so that nothing would interfere with the celebration, and gifts were given all round. It was a time of the brotherhood of humanity, for on that day servants and slaves were given their temporary freedom and were allowed to join in the celebration with their masters and even to be waited on.

The Saturnalia did not disappear. In fact, other evidences of sun worship came in the time of the later Roman Empire. Heliogabalus, a priest of the Syrian sun-god, sat on the Roman throne from A.D. 218 to 222, and about that time, the worship of Mithra, sun-god of Persia, was becoming popular, especially among the soldiers.

The Mithraists celebrated the birth of Mithra at the winter solstice, a natural time, and fixed on the day December 25 so that the popular Roman Saturnalia could build up to the Mithraist "Day of the Sun" as a climax.

At that time, Christianity was locked in a great duel with the Mithraists for the hearts and minds of the people of the Roman Empire. Christianity had the great advantage of accepting women into the religion, whereas Mithraism rejected them (and, after all, it was the mother, not the father, who influenced the religious beliefs of the children). Mithraism, however, had the Saturnalian festival of the sun on its side.

Sometime after A.D. 300, Christianity managed the final coup of absorbing the Saturnalia, and with that it scored its final victory over Mithraism. December 25 was established as the day of the birth of Jesus, and the great festival was made Christian. There is absolutely no biblical authority for December 25 as having been the day of the Nativity.

All the appurtenances of the Saturnalia were adopted anyway - the joy and merriment, the closing of businesses, the brotherhood, the gift of giving. All was given new meaning, but all was still there.

SEEKING MEANING

1. Write a paragraph discussing the theme of "The Flaming God."
2. Make a chart of the various sects Asimov discusses showing the relationships to each other and the names of the various gods. Locate where each sect lived on a world map. Are there any common features? Can geography partly explain their sun gods?

DEVELOPING VOCABULARY

Find the meaning of these words and use each one in a sentence.

myriad	monotheistic	pantheon
progenitor	accretions	alloyed
primitive	presentiment	solstice
appurtenance	inept	configuration

DEVELOPING SKILLS OF EXPRESSION

1. Rewrite the first paragraph from the perspective of a nocturnal creature waiting for the sun to set. Examine Asimov's structure and try to create a similar feeling.
2. While many "primitive" civilizations worshiped the sun, many civilizations learned to use the sun's energy. Study the Pueblo Indian's use of the sun for heating and cooling and prepare an oral report for the class.
3. Scientists are trying to use the sun's energy in many ways. Write a paragraph describing the transition from sun worship to solar utilization in the 1500's, the 1980's, and in the year 2000.
4. If our civilization suddenly ended, what would an explorer think or conclude about our relationship with the sun if he found the remains of our civilization in the year 3000? Write a description using specific adjectives and verbs to describe our relationship with the sun and what it would look like to someone in 1000 years.

THE NORTH WIND AND THE SUN

The North Wind and the Sun had a quarrel about which of them was the stronger. While they were disputing with much heat and bluster, a Traveler passed along the road wrapped in a cloak.

"Let us agree," said the Sun, "that he is the stronger who can strip that Traveler of his cloak."

"Very well," growled the North Wind, and at once sent a cold, howling blast against the Traveler.

With the first gust of wind the ends of the cloak whipped about the Traveler's body. But he immediately wrapped it closely around him, and the harder the Wind blew, the tighter he held it to him. The North Wind tore angrily at the cloak, but all his efforts were in vain.

Then the Sun began to shine. At first his beams were gentle, and in the pleasant warmth after the bitter cold of the North Wind, the Traveler unfastened his cloak and let it hang loosely from his shoulders. The Sun's rays grew warmer and warmer. The man took off his cap and mopped his brow. At last he became so heated that he pulled off his cloak, and, to escape the blazing sunshine, threw himself down in the welcome shade of a tree by the roadside.

SEEKING MEANING

The moral of the "North Wind and the Sun" is often described as "Gentleness and kind persuasion win where force and bluster fail."

1. What implications does this moral have to your daily life and the way you react to others?
2. What characteristic of the sunshine caused the Traveler to remove his cloak?
3. How can this property of the sun be used to benefit man?
4. Can the sun's energy be harmful? How?
5. Why is this property compared to "gentleness and kind persuasion" in the moral?
6. What provided a shade for the Traveler? Name some things that can provide shade for us?
7. Relate the moral of this story to the energy future of the world.

DEVELOPING VOCABULARY

Find the meanings of these words and use each in a sentence.

quarrel

bluster

vain

brow

DEVELOPING SKILLS OF EXPRESSION

Stories of "Good vs. Evil" are common in many countries and almost all civilizations. Most of the time good wins out over evil.

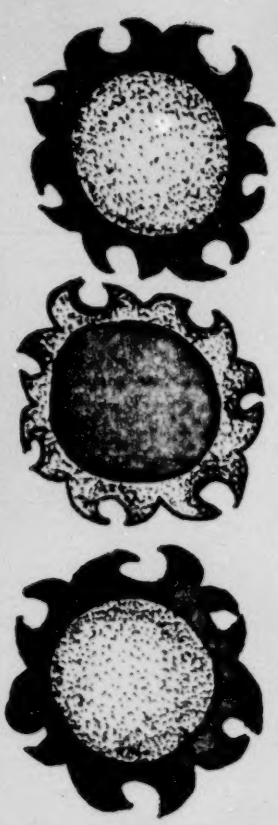
1. Identify the adjectives in the story that describe the sun and the wind.
2. Rewrite the story with the wind and the sun changing roles.
3. Write your own fable about virtues that you admire.



In this poem, the sun god is identified as Apollo.

PHAETHON

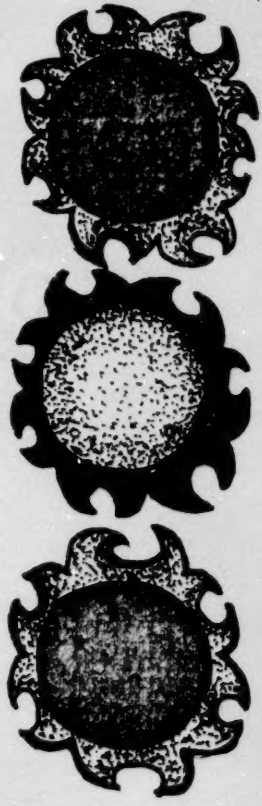
By Morris Bishop*



Apollo through the heavens rode
In glinting gold attire;
His car was bright with chrysolite,
His horses snorted fire.
He held them to their frantic course
Across the blazing sky.
His darling son was Phaethon,
Who begged to have a try.

"The chargers are ambrosia-fed,
They barely took control;
On high beware the Crab, the Bear,
The Serpent round the Pole;
Against the Archer and the Bull
Thy form is all unsteeled!"
But Phaethon could lay it on;
Apollo had to yield.

Out of the purple doors of dawn
Phaethon drove the horses;
They felt his hand could not command.
They left their wonted courses.
And from the chariot Phaethon
Plunged like a falling star -
And so, my boy, no, no, my boy,
You cannot take the car.



*Reprinted by permission; c. 1955, The New Yorker Magazine, Inc.

SEEKING MEANING

1. To whom is the speaker in this poem talking? Why does he tell this person the story of Phaethon?
2. The Serpent in line 12 is the constellation Draco, which is also called the Dragon. Identify the Crab, Bear, Archer, and Bull mentioned in lines 11 and 13.
3. Morris Bishop's story differs from Edith Hamilton's retelling of the myth in certain details. What differences can you find?

DEVELOPING VOCABULARY

Helios, the early sun god, has given his name to a number of English words. Whenever you see a word that begins with helio, you can be sure that it has something to do with the sun.

Find the meanings of these words and use each one in a sentence:

heliocentric

heliotherapy

heliograph

heliotropic

DEVELOPING SKILLS OF EXPRESSION

Compare the underlined verbs in these two descriptions of the Sun's palace:

It was covered with gold and ivory and jewels. Everything inside and outside was very bright and shiny.

It shone with gold and gleamed with ivory and sparkled with jewels. Everything within and without flashed and glowed and glittered.

In the second description, all six verbs specify different ways of sending light.

Selene, Helios' sister, was an early moon goddess, later identified with Artemis. The ancient Greeks believed that Selene drove the chariot of the moon across the sky. Imagine what Selene, her palace, and her chariot looked like. Write a description, using specific verbs to describe the colors, sights, and sounds of the moon goddess's palace, or of her chariot.



TO A FRIEND WHOSE WORK HAS COME TO TRIUMPH*

Consider Icarus, pasting those sticky wings on,
 testing that strange little tug at his shoulder blade,
 and think of that first flawless moment over the lawn
 of the labyrinth. Think of the difference it made!
 There below are the trees, as awkward as camels;
 and here are the shocked starlings pumping past
 and think of innocent Icarus who is doing quite well:
 larger than a sail, over the fog and the blast
 of the plushy ocean, he goes. Admire his wings!
 Feel the fire at his neck and see how casually
 he glances up and is caught, wondrously tunneling
 into the hot eye. Who cares that he fell back to the sea?
 See him acclaiming the sun and come plunging down
 while his sensible daddy goes straight into town.

*From ALL MY PRETTY ONES, by Anne Sexton. Copyright (c) 1961,
 1962. Reprinted by permission of the publisher, Houghton Mifflin Company.

SEEKING MEANING

1. This poem is addressed to someone whose work has been successful. According to the poem, was Icarus' death a defeat or a victory? Which lines support your answer.
2. What metaphor for the sun appears in line 12? Explain it.
3. Are failures of new ideas and experiments as important as successes?

DEVELOPING VOCABULARY

Find the meanings of these words and use each one in a sentence.

labyrinth

awkward

sensible

acclaiming

plushy

casually

DEVELOPING SKILLS OF EXPRESSION

Make a list of the adjectives used to describe Icarus, his flight, and the sun. Explain any similarities and differences. Do they change as the poem nears completion?

The sun is a universal symbol. It has been used by man since the beginning of oral tradition to represent such things as life, day, time, warmth, friendliness, energy, and pleasantness. This activity will help you explore the use of the sun as a symbol.

ACTIVITY

1. Compose a list of "sun songs."

Examples: "Sunshine" (John Denver)

"O Sole Mio"

"You Are My Sunshine"

"You Are the Sunshine of My Life"

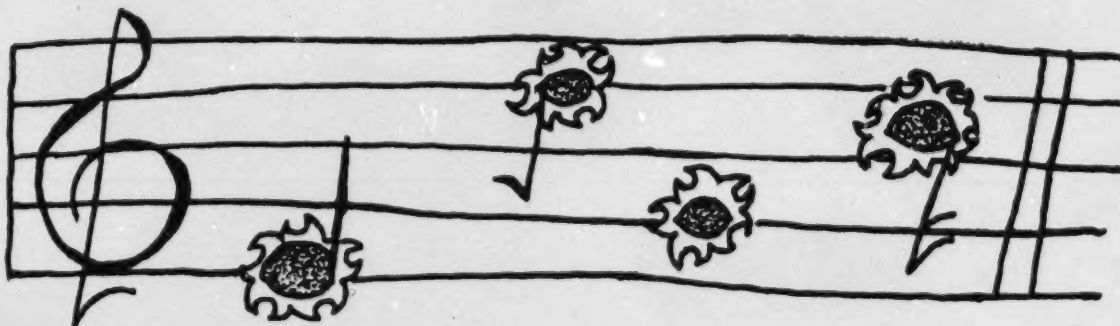
"On the Sunny Side of the Street"

"Sunrise, Sunset" (Fiddler on the Roof)

"Sunny"

Obtain the lyrics for as many as possible.

2. What does the sun represent or symbolize in each song?
3. How do these symbols reflect the actual physical characteristics of the sun?
4. What do these symbols tell us about man's attitude about the sun?
5. Write your own "sun song" or add a new verse to one of the songs on the list. Be sure to keep the rhythm of the original song.

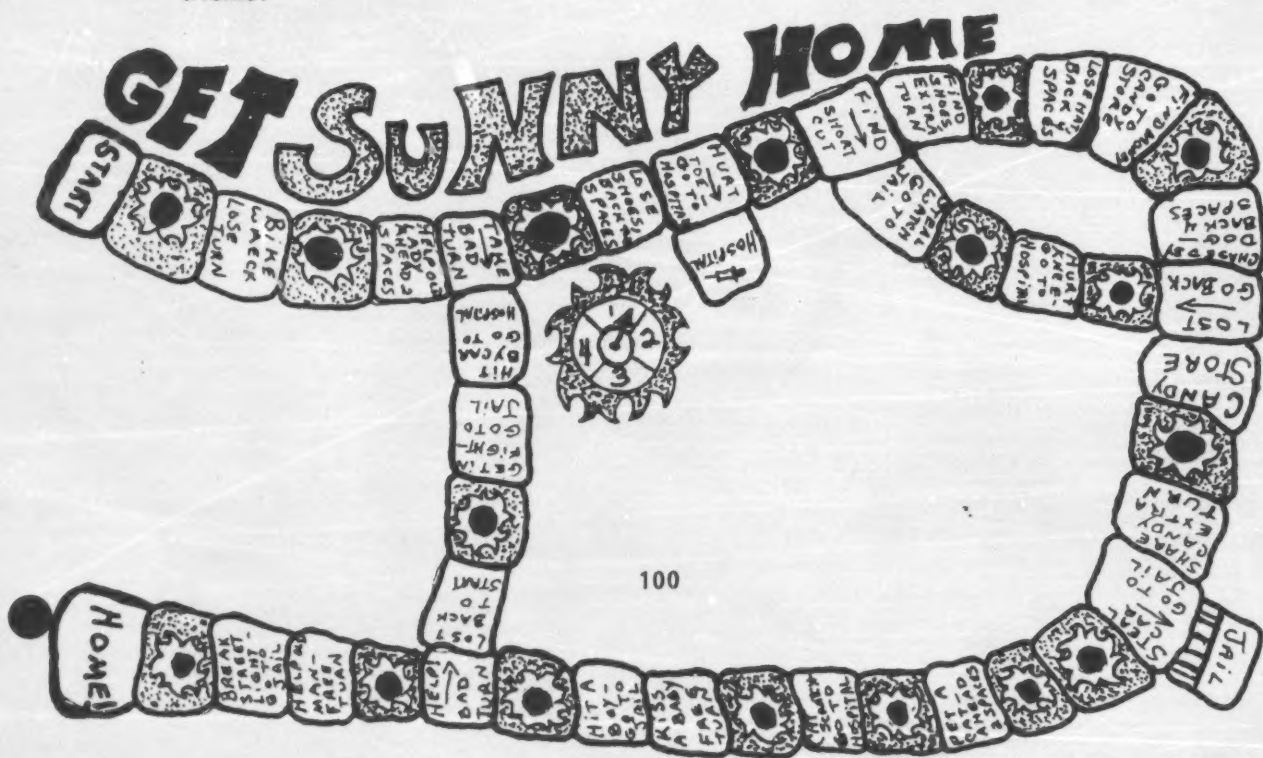


1. Write a poem describing moving air. You may describe a type of wind, how wind makes you feel, or how wind hurts or helps man. You might want to pretend to be the wind or something affected by the wind. The way the sun's heating of earth and water affects the wind might be part of the poem.
2. Write a poem that uses the sun as a symbol or metaphor.
3. Write haiku and cinquain poems about the sun.
4. Write an original poem about the energy crises.
5. Make a poetry booklet using the sun as a theme.
6. Write a concrete (shape) poem about the sun, wind, etc.



1. Write a description of all the electrical sounds around you. Compare this to what it would be like if our electricity ran out. What sounds, if any, would be created as you try alternate methods?
2. Write a short paragraph describing the warm red pulse of the sun. Explain your feelings as you watch or feel the sun.
3. Write a paragraph describing a day in your life, leaving a blank each time you used an energy word.
4. Write a paragraph completing:
 - a) Electricity is.....
 - b) I can enjoy the sun's energy by
5. Write your own myth about how the sun was created.
6. Write a paper describing how your lifestyle would be affected during a period of gasoline rationing or shortage.
7. Write a short story about the sun, either as a class project with each student adding into the story, or as an individual assignment.
8. Find a ray of sunlight coming through a crack or hole. Watch it change. Feel it. Write a short essay of what life would be like inside a sunray.
9. Write a short science fiction story involving the effects upon life resulting from severe changes in solar energy production.

1. Design a city that uses only solar energy.
2. Draw a picture of what your life would be without electricity.
3. Stage a contest for designing Sun Day posters, songs, and T-shirts.
4. Design bulletin board displays about the sun and solar energy issues. Update the displays with "Energy Facts of the Week" brought in by different students.
5. Prepare a program of solar energy films and slideshows.
6. Organize a photo exhibit of solar buildings in the area.
7. Devise a game using the sun as a theme.
8. Make mobiles, puppets, pillows, stationery, banners, T-shirts, collages, magazine montages or soap sculptures with the sun as a theme.



1. Write a newspaper article about lines at gasoline stations and the reactions of people waiting in the lines.
2. Interview someone who can remember gasoline rationing during World War II. Write a newspaper article with the data collected.
3. Write an article investigating the effects of gasoline rationing on the tourist industry and the economy of Florida.
4. Write newspaper feature stories on the topics suggested:
 1. "Too Dangerous? Lyman High Grad Serves On A Nuclear Sub"
 2. "Gas Prices Up, But Oviedo High Students Still Prefer Big Cars"
 3. "Save It, Florida! Governor Graham Leads State Energy Conservation Effort"
5. Do a series of articles for the school paper on forms of alternative energy: solar (active and passive), wind, ocean thermal, wood, methane, gasohol, mariculture, hydropower, photovoltaics, solar power satellite.
6. Write news articles about local builders, businesspersons, homeowners, etc., who are "going solar" or who are staffing a recycling center or providing other energy-saving services.
7. Put together a newspaper "front page" of newspaper clippings that relate to energy from a variety of perspectives: international, environmental, political, human interest, economic, etc.
8. Publish a newspaper designed to informing the rest of the school about the status and promise of solar energy.

**DAILY
SUN**

1. Trace the history of the sun in art through the centuries.
2. Visit an art museum to observe how ancient art includes or excludes in influence of the sun.
3. Perform vocals or instrumentals which allude to the sun.
4. Interview a museum art curator concerning how paintings are placed in a building to heighten the effects of sunlight.
5. Brainstorm and invent energy or energy conservation slogans. Select the best slogans and post in classroom. Send best slogans to the local newspaper, Governor's Energy Office, and the school newspaper.
6. Learn the important words relating to energy and use them to make a word puzzle for the class.
7. Bring a series of energy-saving proposals to the school administration with a plan for implementing them.
8. Follow a particular local energy controversy in the newspaper through the year. Make a scrapbook of all information collected.
9. Write local history focusing on changes in energy use: heating, dress, cooking, transportation, use of renewable vs. non-renewable energy.
10. Debate what the government's policy on energy should be: laissez faire, general subsidy, selective subsidies, energy imperialism?
11. Produce a booklet of tips for using alternative energy and saving conventional energy.
12. Prepare an advertising campaign to promote alternative energy and energy conservation on television, radio, and in magazines and newspapers.
13. Create a photo-essay from magazines photos or original photos that reveal the sun in all its aspects (different times of day or year, different weather condition, reflected off water or shining through leaves, in windows, etc.)
14. Make a scrapbook of energy-related cartoons.

15. Ask the principal to declare Sun Day in the school as a special day devoted to solar energy studies, special programs, games, contests, presentations, and exhibits.
16. Develop an energy presentation for the community that includes displays, shows, speeches, art work. Identify buildings in the community that waste energy, and offer possible conservation programs as solutions. Investigation building codes to see if solar energy is being encouraged or discouraged. If the latter, then consider possible changes.
17. Listen to the John Denver record "Sunshine," and consider how sun has affected our modern culture.
18. Locate examples of "sun" in our culture. Find brand names that use "sun" in them.
19. Find examples of modern "sun worship." Show how modern sun worship has affected industries in Florida (suntan lotions, retirement, vacations).
20. Make a bulletin board display of pictures of the sun, sunrises, and sunsets.
21. Investigate the "Cirviltkonian," a sun ceremony of the Papago Indians of the southwestern U.S. (Dancers circle a sand painting of the sun and thereby recharge themselves with its life-giving energy.) Perform the dance for the class. Research dances and rituals that mythologize the sun. Perform or describe them for the class.

Activity 1

Energy Advertising

Directions: List as many ads as possible which use the sun. Find newspaper, radio, television, magazine ads or product label examples to show to the class.

Examples: "When You Need the Sun" - Eastern Airlines
 "Sunny Florida" - Tourism
 "Sunshine Tree" - Citrus
 Sun Bank
 Sun Maid Raisins
 Sun Air - Airlines
 100% Natural Cereal - Sun and a barn on the label
 "Let McDonalds Put Sun into Your Morning" - Breakfast

What emotions or feelings about sunshine do these ads use to sell their products?

Activity 2

Directions: Find examples of energy related ads in maps, news, and television.

Examples:

- a. solar pool heaters
- b. gas savers for autos
- c. awnings
- d. solar watches
- e. energy sauna houses
- f. windmills
- g. high mileage cars
- h. woodburning stoves
- i. fireplaces
- j. gasohol

What advertising appeals do these products use?

Examples: something new
 saves money
 conservation
 safety
 famous person endorsement
 happy family
 rebates
 patriotism



Activity 3

Directions: What types of ads are electric, gas and gasoline companies running on television, in newspapers, and in enclosures with their billings? What claims about savings and conservation are they making? How about new energy forms and research? Bring in examples.

Activity 4

Directions: Think of a new product that uses the sun, the wind, or biomass conversion for power. Develop a commercial for this product.

- a. Develop a symbol and/or logo.
- b. Construct a poster or billboard-type ad using a specific advertising method.
- c. Make a story board for a short television commercial for your product.
- d. Use video tape or present it live to the class to produce the commercial.

NOTE: You may need to make a model of your product.

Example: A solar operated movie camera (no batteries)

Activity 5

Directions: To think about, write about, discuss, or debate:

If conserving energy, especially electricity, is important to this country's energy future, should billboards and other advertising media (signs, etc.) be lighted?

Pros and cons are available through library research.

California Raisins. Nature's Candy.

ADVERTISING-EXAMPLES



May we
present the
guy who
makes our
snack so
good for kids.

He's a
familiar
sight. An old
friend. And
makes a
snack kids love
without using

preservatives, additives, or
the artificial this-or-
that you find
in most manu-
factured
snacks.

Because
the sun dries
raisins
naturally,
he doesn't
need artificial
help to make
them chewy
or sweet.

Next time your
kids want
snacks, give
them raisins.



Why not give your kids
a bit of the sun.

Raisins from California.

COMET AWNINGS

"THE ENERGY SAVER"

35% Off
Installed with purchase of 3 or more.

- Choice of colors • Baked enamel finish
- Positive storm protection • Helps cool interiors • All sizes available • Folds down in seconds!



CERTIFIED HURRICANE PROTECTION

the Energy Reducer

FOR WATER HEATERS



WATER HEATER INSULATION
Fiberglass insulation blanket installs easily to help conserve energy. 11/5008

ENERGY HOUSE

REPLACEMENT WINDOWS

SAVE ENERGY AND \$\$\$

Insulated Double Hung Windows Installed
27" x 36" only \$99.75
Most sizes under \$100.00 installed

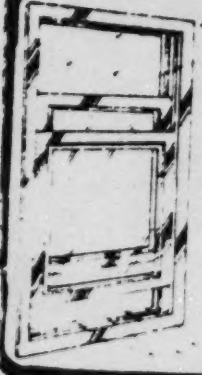
Full or partial ventilation, top or bottom.
Both panels remove to the inside for easy cleaning.
Installed without structural alterations.

DUAL GLAZE INSULATED SASH AVAILABLE

Saves heat in the winter and cooling costs in summer.

- FREE ESTIMATES
- BUILDERS & COMMERCIAL WELCOME
- MOST TYPES OF WINDOWS
- GLASS PORCH ENCLOSURES

SEALTITE WINDOW CO. ORLANDO WINTER PARK 305-678-1298	THE WINDOW SHOP DAYTONA 904-673-0535	DELAND 904-734-9271
--	---	------------------------




10/Sentinel Star, February 22, 1981

What is the relationship between energy shortage and advertisements for business products?

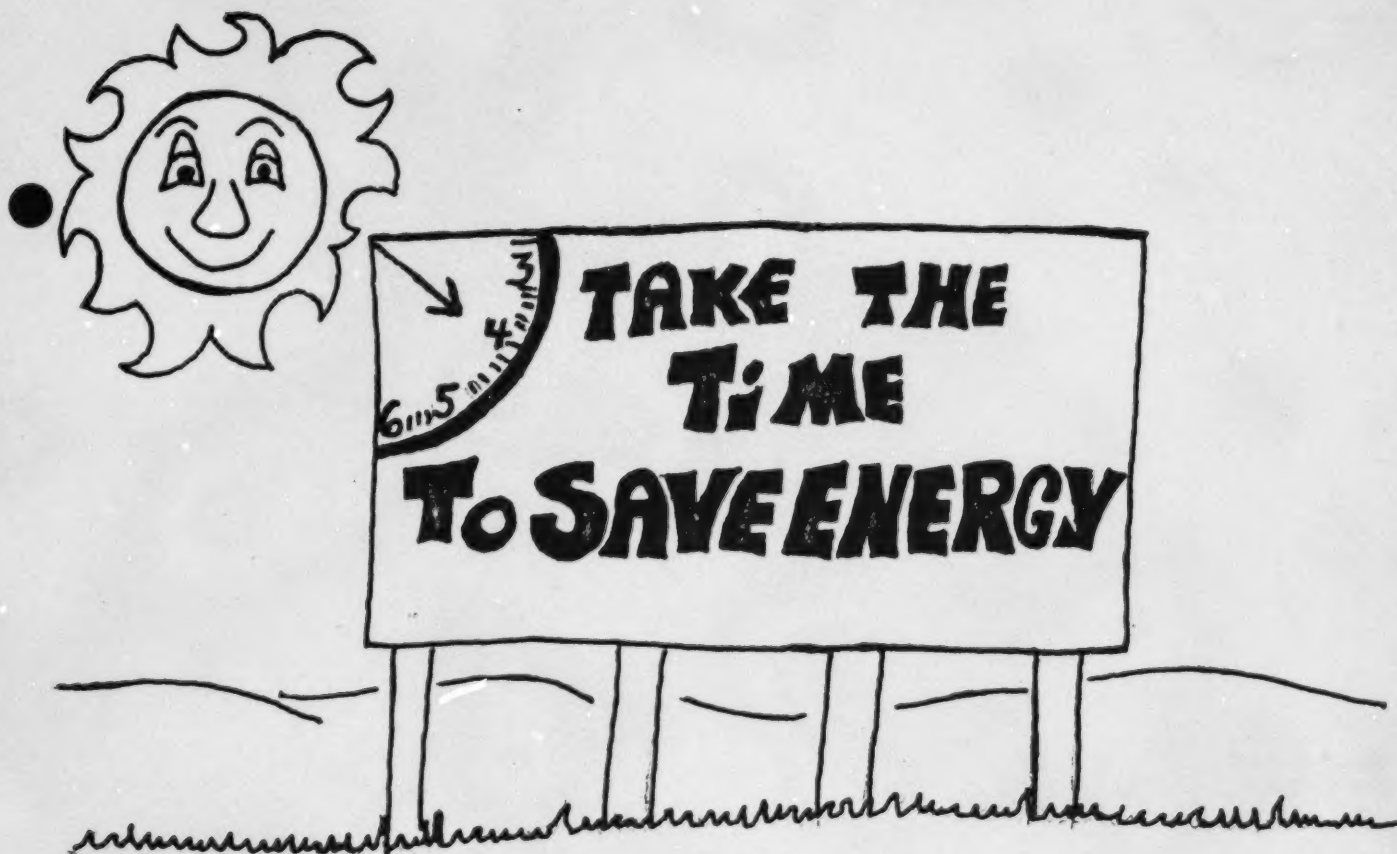
Activity 1

1. Collect energy industry advertisements from newspapers and magazines and discuss their messages to the public.
2. Classify the advertising into categories. (Price rise justification; "what a good job of conservation we're doing"; cost of regulation; "survival" ads arguing against divestiture of competing energy sources, etc.)
3. Discuss the validity of each of the categories of advertisements you collected.
4. Are the arguments of the energy companies persuasive?
5. Look for advertisements that "turn you off" or "turn you on."
6. Discuss the reasons for the "turn off" or "turn on."
7. Collect ads from other businesses or industries that contain an energy message. (low mileage cars, etc.)
8. Look for ads which indicate a change in approach because of the energy shortage. (Large cars emphasizing mileage and smaller size instead of luxury, etc.)
9. Why would an electric power advertisement call for conservation and decreased use of electricity?
10. Create a "billboard" or bulletin board advertisement for your school which stresses conservation of electricity.

Activity 2

1. Design a cover for a new magazine to be called EN-ER-GEE.
2. Write an advertisement to appeal to new subscribers for your new magazine.
3. Design and produce a television commercial for the magazine.

4. Write a radio commercial for EN-ER-GEE.
5. Write the first energy editorial for EN-ER-GEE.
6. Write a "letter to the editor" of EN-ER-GEE supporting or criticizing the first editorial.
7. Divide the class into several editorial boards which will suggest topics for inclusion in the magazine.
8. Design the magazine on the basis of class recommendations.
9. Write articles for the magazine.
10. Illustrate the articles.
11. Duplicate the magazine for students to take home.



ANSWER KEY

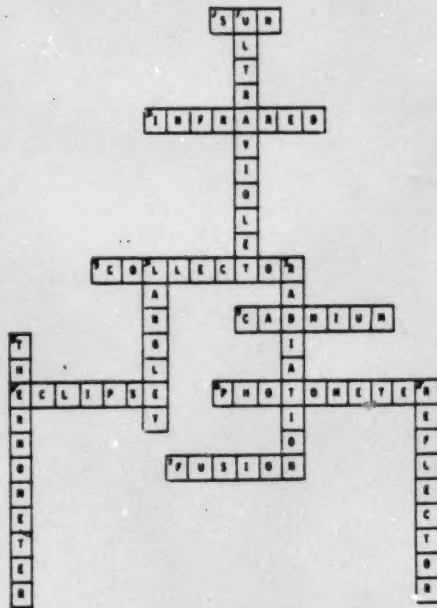
UNIT I

BUILDING VOCABULARY SKILLS

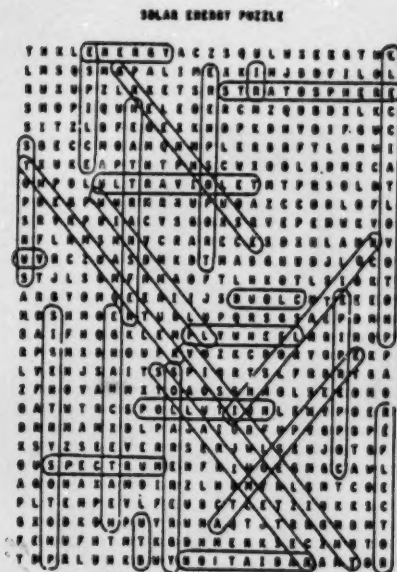
ACTIVITY 1, Page 2

1. absorbed - to take up (sound, light, etc.) without reflection
temperature - a measure of the warmth or coldness of an object or substance
2. reflect - to cast back (light, heat, sound, etc.) from a surface
3. aluminum - a light, silvery metal that does not easily corrode
reflectors - polished surfaces that reflect or focus rays of light, heat, etc.
4. furnace - a structure or device in which heat is produced for heating a house, melting metals, etc.
5. cells - a photovoltaic cell (as one including a junction between two types of silicon semiconductors) that is able to convert sunlight into electrical energy and is used as a power source
battery - a group of electric cells connected together to yield a higher voltage or current than a single cell
chemical - of, used in, or produced by chemistry
6. fuel - something that is burned to give heat or to power an engine
7. petroleum - a dark-colored liquid found in the earth from which many fuels, lubricants, and waxes are made; oil
8. scientists - persons who specialize in one of the sciences
solar - of, based on, or operated by the sun or sunlight
fossil - of the nature of a fossil
9. sugarcane - a tall plant, similar to bamboo, whose sweet juice is a principal source of sugar
tropical - of, belonging to, or found in the tropics
alcohol - a colorless, flammable liquid, produced by distilling fermented solutions of molasses or grain
10. equipment - anything kept or provided for a particular purpose; apparatus
collect - gather
materials - the substances of which a thing is made or composed
11. measured - to find the size, extent, dimension, quantity, or capacity of something
instruments - to tell in written or spoken words
physical - having material existence, perceptible especially through the senses and subject to laws of nature
details - an individual item or small part that goes to make up a whole.

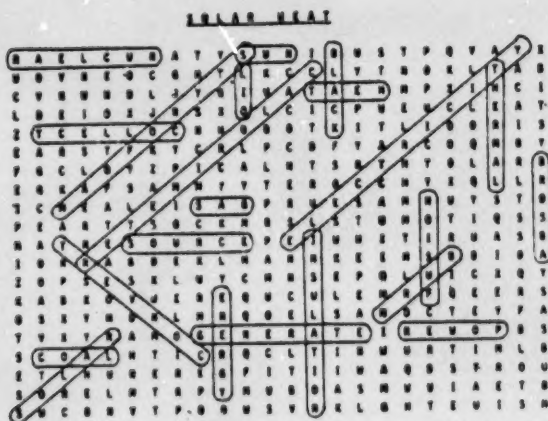
ACTIVITY 2, Page 3



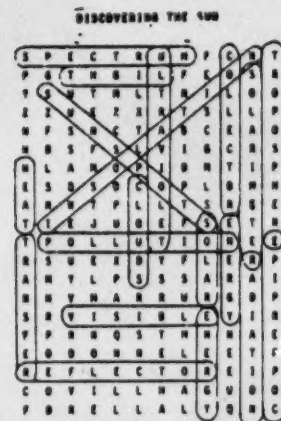
Activity 3, Page 4



ACTIVITY 4, Page 5

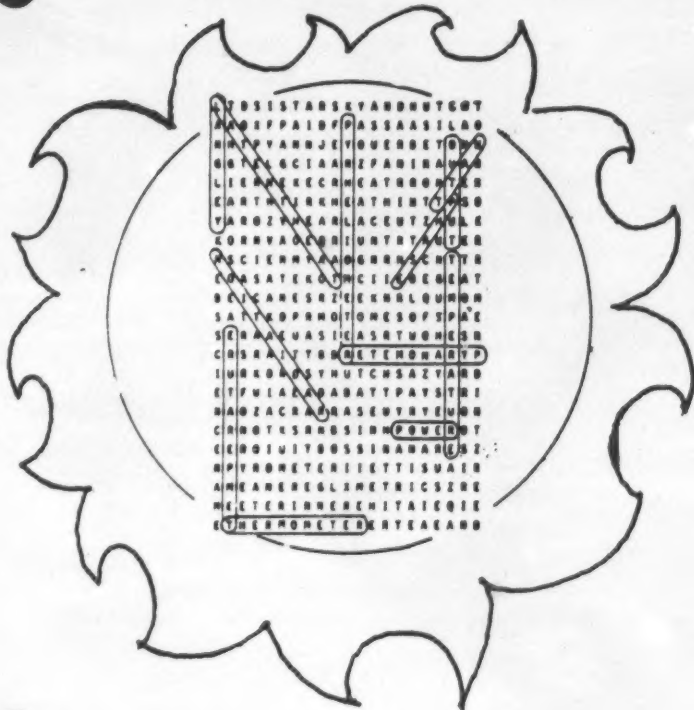


Activity 5, Page 6



ACTIVITY 6, Page 7

SOLAR ENERGY WORD FIND



ACTIVITY 7, Page 8

JUMBLES

Unscramble the letters below into a word. The letters circled will give the answer to the statement below when unscrambled.

ROALS
BITENU
PICSLEE
NECTRUPS
GENREY

BATHERS BOTHER

PUSTOSH
DUCOL
LWINDINL
GNIL
LOCERCOTL

ASTHNETICS ABRAYATION

SOLAR
INDIAN
ECLIPSE
SPECTRUM
VISIBLE

THERMOMETER

WINDMILL
ENERGY
COPPER
RADIATION

POLLUTED

ACTIVITY 8, Page 9

SOLAR ENERGY QUIZ

Match Column A with the underlined scrambled words in Column B

COLUMN A		COLUMN B
1 Pyrometer	6	spoonstr
2 Albedo	10	terabinsop
3 Langley	2	dechoi
4 Collector Box	4	lavorisal oob
5 Incident Angle	9	awitsonmr
6 Temperature	3	grilno
7 Pyromometer	5	iditwne negel
8 Collector Efficiency	8	fiencifayc aliolectre
9 Thermometer	1	retayvopam
10 Absorption	7	prhtaltoromay

ACTIVITY 10, Page 11

Answer's given on student copy

ACTIVITY 9, Page 10

A SOLAR PERSPECTIVE

Select the words that best fit the definition and read the vertical message.

When the moon comes between the earth and the sun

Shiny particles _____ the sun's rays

The middle layer of the atmosphere

Radiators heat rooms by

Solar cells are also called _____ cells

Light can be broken down and observed as a

Light we can see is called

TV interference is often caused by

Florists have used this solar collector for years

Green plants use the sun for

An instrument used to measure temperatures

Found in Holland, they use a form of the sun's energy

The ability to do work

Used as piping in solar collectors

The sun's rays come to earth as

Light waves sometimes used in cooking

ECLIPSE

REFLECT

STRATOSPHERE

CONVECTION

PHOTOVOLTAIC

SPECTRUM

VISIBLE

SUNSPOTS

GREENHOUSE

PHOTOSYNTHESIS

THERMOMETER

WINDMILL

ENERGY

COPPER

RADIATION

INFRARED

ANSWER KEY
UNIT II
BUILDING READING SKILLS

CONTEXT CLUES, Pages 12, 13, & 14

NOTE TO TEACHER: Words or phrases that help the students define the given words should be underlined by the students on their papers. Only the definitions are given here; however, the types of clues that are used in the article are listed under the words to aid you in your discussion of context clues.

1. thermal energy - sunlight converted into energy that can be collected, stored, and distributed.
(Example & Explanation)
2. active system - system that uses mechanical power like pumps or fans to collect, store, and distribute energy.
(Examples)
3. passive system - system that uses natural energy flows produced by conduction, convection, and radiation to store and transport thermal energy within a structure.
(Explanation)
4. heavy building materials - concrete, brick, and water.
(Examples)
5. direct gain systems - systems that incorporate south-facing windows, (often called solar windows) to admit sunlight into the living space.
(explanation)
6. radiant energy - longwave heat energy.
(Synonyms)
7. thermal drapes - movable window insulation.
(Synonyms)
8. thermal storage walls - indirect gain system with massive storage material placed between the solar windows and the living space.
(Comparison/Contrast)
9. indirect gain - a gain of heat energy through a thermal storage wall.
(Explanation)
10. sun spaces - space between the solar windows and storage wall that can be used as a greenhouse, atrium, entry foyer, sun room, or simply as a buffer zone.
(Comparison/Contrast)
11. roof ponds - containers of liquid placed in a horizontal position in the roof and used for heating or cooling.
(Comparison/Contrast and Explanation)
12. convective loop - a circulation of air caused by heating the air on only one side of a container. When a fluid (either liquid or gas) is heated it tends to rise, leaving behind a space or low pressure zone, and other cooler fluids rush in to fill that space.
(Explanation)

CONTEXT CLUES, Pages 12, 13, and 14 (Continued)

13. circulate - to move or send from one place to another. The air
(Example & Explanation) circulates.
14. thermosiphon system - an arrangement of siphon tubes for
(Explanation) assisting circulation in a liquid.
15. absorber plate - plate in an active solar system that transfers
(Explanation) the sun's heat to a working fluid (either a liquid or air).
16. reradiation - loss of heat energy to the environment.
(Explanation)
17. absorption chillers - a cooling device similar to those in gas
(Comparison) refrigerators.

INFLECTION: ADJECTIVES & ADVERBS

ACTIVITY 1, Pages 15 & 16

1. A
2. C
3. C
4. A
5. A

ACTIVITY 2, Page 16

1. A
2. A
3. A
4. B
5. B

WORD PARTS

ACTIVITY 1, Page 17

1. bio - life
2. mass - quantity or amount of matter
3. atom - small partical of matter containing a heavy center of protons and neutrons around which revolves electrons
4. oxy or oxi - oxygen
5. vert - change
6. cyclo - circular; repeating sequence
7. hydro - water
8. therm - heat
9. geo - earth
10. gen - make; create

WORD PARTS

ACTIVITY 1, Page 17 (Continued)

11. kilo - 1 thousand
12. mega - 1 million
13. ology - study of; science of
14. petro - oil
15. photo - light
16. sol - sun (light)
17. electr or electro - electricity - negative and positive charges in nature or artificially produced
18. act - movement; using motion
19. pass - still; unmoving
20. gas - matter with no specific shape; vapor
21. linear - in a line; straight
22. watt - unit of measure of electrical current
23. port - carry; harbor
24. energy - capacity for performing work (force times distance)
25. syn - same or nearly the same
26. nucleus - center; core
27. neg - not; denial; opposite
28. pose - to place or put
29. magnet - piece of material able to attract iron
30. duct - tube, pipe, channel, or method for movement

ACTIVITY 2, Page 17 --- NOTE: Answers may vary. The teacher should emphasize that word parts may have more than one meaning.

- | | | |
|----------------------------|----------------------------|-------------------------------------|
| 1. mis - not; against | 12. pre - before | 23. semi - half; almost |
| 2. re - again; back | 13. pro - for | 24. sub - below; under; in place of |
| 3. un - not | 14. ante - before | 25. super - over; above; large |
| 4. ad - add to; against | 15. anti - against | 26. trans - across |
| 5. com - together | 16. auto - self | |
| 6. con - against | 17. en - be able | |
| 7. de - not; against, down | 18. ex - against; not; out | |
| 8. dis - not | 19. inter - between | |
| 9. im - into; not | 20. intra - within | |
| 10. in - into; not | 21. mal - bad | |
| 11. non - not | 22. multi - many | |

WORD PARTS - Activity 3, Page 18

ACTIVITY 3, Page 18 --- NOTE: Answers will vary.

Examples: report
transport
import

reactive
impassive
invert

revert
intravert
interactive

ACTIVITY 4, Page 18 --- NOTE: Answers will vary. The teacher should emphasize that word parts may have more than one meaning. These are examples only.

1. -er = noun - one who does something
porter = one who carries
2. -ful :: adjective - full of
helpful = full of help
3. -ly = adverb - in a particular manner
actively = to do something in an active manner
4. -ness = noun - quality or condition of being
passiveness = condition of being passive
5. -teen = the numbers 13 to 19 inclusive;
the years 13 to 19 in a lifetime or century
seventeen = 17
6. -y = adjective = full of; containing; having
salty = containing salt
7. -able = able to be
portable = able to be carried
8. -age = noun - an action or process; a state or condition; the
number of
wattage = the number of watts
9. -al = adjective - of or having to do with
thermal = of or having to do with heat or temperature
10. -an = noun - a person who deals with
electrician = a person who deals with electricity
11. -ar = adjective - of, like, or referring to
solar = referring to the sun
12. -ation = noun - state or condition
starvation - state or condition of starving
13. -en = verb - to make or become
sweeten = to make or become sweet
14. -hood = noun - state, quality, or condition
childhood = state of being a child
15. -ible = adjective - able to be
convertible - able to be converted

WORD PARTS

ACTIVITY 4, Page 18 (Continued)

16. -ic = adjective of; having the nature of; having to do with
hydraulic = of or having to do with water
17. -ion = noun - the act or process of
generation = the act or process of generating
18. -ish = adjective - like or resembling
boyish = like or resembling a boy
19. -ist = noun - one who deals with
biochemist = one who deals with the chemistry of living things
20. -ment = an action, or the result of an action
development = the action or the result of developing
21. -or = a person or thing that does something
generate = a person or thing that generates
22. -ous = full of; having the nature of
poisonous = full of poison
23. -sion = noun - action or process of
conversion = act or process of converting
24. -th = noun - quality or condition
warmth = quality or condition of being warm
25. -tion = noun - state or condition
position = state or condition in which a person or thing is posed
26. -ance = noun - action or process
resistance = action or process of resisting
27. -ant = noun - one who
assistant = one who assists
28. -ate = verb - to make or cause to be
activate = cause to be active
29. -ence = noun - state or condition of
existence = state of existing
30. -ent = adjective - doing or being something
different = being not alike
31. -ity = noun - having the quality or characteristic of
electricity = having the quality or characteristic of electricity
32. -ive = having the nature or quality of
negative = having the nature or quality of being opposite
33. -ize = verb - to treat or combine with
oxidize = to combine with oxygen

ACTIVITY 5, Page 18

NOTE: Answers will vary.

Examples: importation
deactivate

demagnetize
unhelpful

ACTIVITY 6, Page 18

NOTE: Answers will vary.

WORD PARTS

ACTIVITY 7, Page 18

- a. geo - earth
therm - heat
al - of or having to do with
- b. bio - life
mass - quantity or amount of matter
- c. sol - sun
ar - referring to
ium - small one: mass - esp. in botanical terms
- d. gas - matter with no specific shape; vapor
ohol -
- e. photo - light
volta - of, relating to, or producing direct electric current by chemical action
ic - having the nature of
- f. mega - great, mighty
watt - unit of measure of electrical current
- g. syn - same or nearly the same
fuel - any matter used to produce heat or power
- h. quadri - four
llion -
- i. bio - life
con - with
ver - turn
sion - action or process
- j. hydro - water
electr - electricity
ic - having the nature of
- k. horse - animal
power - ability to act; capacity for action
- l. hydro - water
therm - heat
al - of or having to do with
- m. kilo - 1 thousand
watt - unit of measure of electric current
- n. photo - light
electr - electricity
ic - having the nature of
- o. photo - light
syn - same or nearly the same
thesis - to place or set
- p. thermo - heat
dynam - power
ic - having the nature of
s
- q. thermo - heat
stat - standing fixed

STATED MAIN IDEA, Pages 20, 21, and 22

- | | |
|------|------|
| 1. B | 4. B |
| 2. B | 5. A |
| 3. A | 6. D |

INFERRED MEANINGS, Page 23

NOTE: Response will vary.

WHO, WHAT, WHERE, WHEN, WHY

ACTIVITY 1: Transportation and the Five W's, Pages 24, 25, and 26

- | | | |
|----|----------------|---|
| 1. | What: | Camel |
| | Where: | Africa; Middle East |
| | Why: | Camels can survive hot and dry conditions |
| | Energy Source: | Food; muscle power |
| 2. | Where: | Japan and China |
| | Energy Source: | Food; muscle power |
| 3. | What: | Canoe |
| | Who: | American Indians |
| | When: | 200-300 years ago |
| | Why: | Easy access to waterways |
| | Energy Source: | Moving water; food; muscle power |
| 4. | What: | Covered wagons |
| | Who: | American pioneers |
| | Where: | American West |
| | Energy Source: | Food; muscle power |
| 5. | What: | Early locomotives |
| | Why: | Fast and convenient |
| | Energy Source: | Coal; earlier, wood |
| 6. | What: | Plane; car; truck (bus) |
| | When: | Last half 20th century |
| | Where: | All over the world |
| | Energy Source: | Oil & petroleum |

WHO, WHAT, WHERE, WHEN, WHY & HOW

ACTIVITY 2: The Solar Airplane, Page 27

- | | | |
|----|--------|--|
| 1. | Who: | Janice Brown |
| | What: | Flew a solar powered plane |
| | Where: | Around Arizona & California |
| | When: | Recent months |
| | How: | Sunlight, activating a small electric motor, turns the propeller |
| 2. | Who: | Paul MacCready |
| | What: | Built sun-driven plane |
| | Why: | Fun; history-making; boost for solar energy |

WHO, WHAT, WHERE, WHEN, WHY & HOW

ACTIVITY 2: The Solar Airplane, Page 27 (Continued)

3. Who: Solar Challenger
What: Flew 14 miles
When: Winter
How: Solar cells convert sun's power to electricity
4. Who: I (MacCready)
What: Involved in solar-powered flight
When: Now
Why: How can I help decrease dependence on foreign oil?

ORDER OF DETAILS

ACTIVITY 1, Page 28

After 20 years of the Atomic Age, people still do not agree about atomic energy. Some think it's bad. They say that the power released by splitting atoms may destroy the human race in another war. Others say atomic energy is good. They say atomic energy can help if it is used for peaceful reasons. Also, they say, atomic weapons are so powerful that no nation would dare use them.

(F, C, A, B, E, D)

ACTIVITY 2, Page 28

Solar energy is not a new science. In 212 BC, Archimedes utilized the sun's radiation to burn the sails of the Roman fleets. The Romans lost the battle. Later, in 1878, a solar steam engine was exhibited at the Paris fair. Then, during the 1930's, Massachusetts Institute of Technology started experimenting with solar energy. Much of the research that was conducted at MIT is being utilized by manufacturers today.

(C, F, B, D, A, E)

DETAILS, Pages 29, 30, and 31

Questions

1. B
2. C
3. B
4. A
5. C
6. C

Vocabulary

1. C
2. A
3. B
4. C
5. B
6. C
7. A

Finding the Main Idea

A. c.

CAUSE AND EFFECT, Page 33

Cause

1. - fuel crisis
 - using more energy than we were producing
 - demand exceeded supply
2. - using old wells
3. - oil embargo
4. - oil embargo
5. - shortage
 - continuing present consumption
6. - need for cheap energy

Effect

1. - focused attention
 - shortages
 - shortages
2. - not enough oil
3. - understanding of energy crisis
4. - created need to find alternate sources
5. - import foreign oil
 - will double the amount of oil needed from foreign countries
6. - looking for alternate sources

FACT AND OPINION, Page 34

- | | |
|------|-------|
| 1. O | 6. F |
| 2. F | 7. O |
| 3. F | 8. O |
| 4. F | 9. O |
| 5. F | 10. O |

TABLE OF CONTENTS, Page 44

- | | |
|------------------|--------------------|
| 1. 109 | 6. Index (pg. 143) |
| 2. 11 | 7. yes (Ch. 5) |
| 3. 3 or 4 | 8. no |
| 4. yes (pg. 141) | 9. Ch. 9; Index |
| 5. 1 | 10. no |

INDEX USE, Page 45

- | | |
|------------------------------------|--|
| 1. 1, 9, 25, 31-47, 32, 35, 37, 49 | 6. 11 |
| 2. 33 | 7. 91-92 |
| 3. 36-43, 39 | 8. 29 |
| 4. Ovens | 9. Ericsson, John
Jackson, Dr. Ray
Kobayashi, Dr.
Langley, Dr. S.P. |
| 5. 48-56 | 10. 4 |

ANSWER KEY
UNIT III
BUILDING WRITING SKILLS

NOUN PLURALS

ACTIVITY 1, Page 47

1. stars
2. fuels
3. kilowatt hours
4. tasks
5. calories

ACTIVITY 3-A, Page 48

1. rays
2. keys

REGULAR VERBS

ACTIVITY 1, Page 49

1. principal parts
2. tense
3. ing, ed
4. ed
5. It is dropped.
6. d
7. It is doubled.

ACTIVITY 3, Page 51

1. helped
2. supply
3. believe
4. experimenting
5. heat
6. generate
7. recognized
8. hope

ACTIVITY 2, Pages 47 and 48

1. businesses
2. churches
3. taxes
4. wishes

ACTIVITY 3-B, Page 48

1. batteries
2. quantities
3. supplies

ACTIVITY 2, Page 50

1. pass
2. moving
3. floated
4. melt
5. supplying
6. realized
7. producing
8. use
9. stored
10. measured

WINDMILLS

Since the 1850's, six million windmills have been installed in the United States. A large experimental windmill built by the Department of Energy started turning in Clayton, New Mexico, last month and is expected to generate up to 15 percent of the electric power used by the town's 3,000 residents. Because of the expense, small windmills for home electric use are used only by houses far from electric power lines. Unless the windmill is used just to add to existing power supplies, a storage system must be used.

BIOMASS CONVERSION

Each year tremendous quantities of timber are harvested across the country. They are processed into lumber, plywood, or pulp. These wood operations generate large volumes of wood and bark wastes. Some of these wastes are processed into pulp, plywood, paper, and paper products. The seven million dry tons of wood and bark wastes generated on the Pacific Coast could replace some other fuels at factories.

Wood residues for fuel must first be reduced to a size that can be handled conveniently. Large volumes of wood and bark residues can be effectively reduced in size by a "hog" machine (a mechanical shredder). The particles produced by this piece of equipment are commonly called hogged fuel. Hogged fuel can include any portion of wood or bark in a particle size. This may also include sawdust, wood shavings, and ground bark. So, hogged fuel may be a combination of many types of wood wastes.

Wood wastes can be utilized in a number of ways. Large power plants are not the only means of energy recovery. Logs for home fireplace use can be made from sawdust, wood chips, and other burnable materials mixed with wax. Logs made from leaves have currently become profitable. The leaves are separated, dried and shredded before they are mixed with wax. Then they are compressed and formed into sixteen-inch-long by four-inch-diameter logs.

All wood wastes could be treated in a similar manner. These wastes are all around us and are usually available to the fuel processor at no cost. Sometimes the waste producer will even pay the fuel processor when the wastes are removed.

ADJECTIVES, Page 54

SOLAR THERMAL ENERGY

NOTE: The words "air conditioner" are considered one noun.

Solar thermal (sun powered heat) systems can be used to produce steam in industrial processes, to generate electricity, and to supply heat for homes and offices. They can use simple flat-plate collectors that trap enough sunlight to heat air and water. A large market for solar thermal energy exists in the food, textile, and chemical industries where great amounts of intermediate temperature heat are used. Most of the equipment needed for solar thermal heating is available. Further improvements should be made on heat engines that convert solar heat into shaft power to drive a generator, air conditioner, or whatever. Solar water heaters for home use are as cheap as electric water heaters if you compare life time costs.

Industrialized countries, like the United States and Japan are beginning to recognize the unlimited potential of applying bountiful solar power to industrial uses. Every house and every building is a solar collector and, if our modern houses are designed correctly, solar thermal energy warm people through long, cold winters and require only limited supplies of fossil fuel as back-up energy.

SUBJECTS AND VERBS, Page 55

<u>Subject</u>	<u>Verb</u>
1. power	serves
2. appliances	work
3. supply	seems
4. lives	would be
5. all	expect
6. creation	is
7. plant	converts
8. persons	watch
9. station	produces
10. generator	is
11. generators	are driven
12. outlets	conduct
13. lines	carry
14. wires	distribute
15. homes	are equipped
16. home	uses
17. panels	convert
18. panels	are called
19. batteries	can store
20. windmills, turbines	can drive

A-15

SENTENCE PATTERNS, Page 56

- | | |
|--------------|---------------|
| 1. N-V-N | 9. N-V-N |
| 2. N-V | 10. N-V |
| 3. N-V-N | 11. N-V |
| 4. N-LV-Adj. | 12. N-LV-Adj. |
| 5. N-V-N-N | 13. N-V-N |
| 6. N-V-N | 14. N-V-N-N |
| 7. N-LV-N | 15. N-V-N |
| 8. N-V-N | |

COMPOUND SUBJECTS OR VERBS

ACTIVITY 1, Page 57

- oil, coal
- Glenn T. Seaborg, associates
- wood, coal
- gasoline, oil
- food, energy, resources

ACTIVITY 2, Page 57

- are heated, cooled
- researched, discovered
- designed, built
- bought, installed
- must conserve, use

ACTIVITY 3, Page 58

- Heat energy melts solids and changes liquids into gases.
- Land masses heat up and cool down faster than water masses.
- The air expanded and became less dense.
- The evacuated tube concentrator and the photovoltaic cells collected energy from the sun.
- Oil and motion can be cranged into electrical energy.

SUBJECT AND VERB AGREEMENT

ACTIVITY 1, Page 59

- | | |
|--------------------------------------|---|
| 1. <u>water</u> <u>absorbs</u> | 7. <u>oceans</u> <u>contain</u> |
| 2. <u>Food</u> <u>provides</u> | 8. <u>we</u> <u>(can)</u> <u>generate</u> |
| 3. <u>Generators</u> <u>convert</u> | 9. <u>cars</u> <u>use</u> |
| 4. <u>Electricity</u> <u>depends</u> | 10. <u>We</u> <u>realize</u> |
| 5. <u>body</u> <u>passes</u> | |
| 6. <u>waves</u> <u>pass</u> | |

SUBJECT AND VERB AGREEMENT

ACTIVITY 2, Page 60

- | | |
|--------|-----------|
| 1. is | 6. are |
| 2. are | 7. are |
| 3. is | 8. is, is |
| 4. is | 9. is |
| 5. are | 10. are |

COMPOUND SENTENCES

ACTIVITY 1, Page 61

1. The energy crisis will be with us for a long time, but we can make use of it by deciding what things are really important.
2. It is true that the sun is always supplying us with energy, yet in the future, it could be that we will use up all of the energy that has been stored in our fossil fuels -- coal, oil, and natural gas.
3. Solar energy is the ideal energy source, for it is clean to produce, clean to use.
4. The United States has only 7% of the world's population, yet we use over 30% of the world's energy.
5. If we conserve, we'll need less energy, or our supply will run dangerously low.
7. Reduced driving speeds help save gasoline, and they also cut down on accidents.

SENTENCE COMBINING

ACTIVITY 1, Page 62

NOTE: Answers will vary.

ACTIVITY 2, Page 63

NOTE: Answers will vary.

ACTIVITY 3, Page 63 & 64

NOTE: Answers will vary.

ACTIVITY 4, Page 65

NOTE: Answers will vary.

SPELLING

ACTIVITY 1, Page 69

For several reasons it is important to be able to store energy. One good reason is that it can then be kept for later use. The energy gathered from the wind by a windmill, for instance, can be used only while the wind is blowing, unless it is stored in some way. Another reason is that when energy is stored in matter it can be shipped easily from one place to another. A third reason for storing energy is that it can then be carried with us when none is available along the way.

SPELLING

ACTIVITY 2, Page 69

- | | |
|------------|------------|
| 1. gas | 6. we'll |
| 2. step | 7. saving |
| 3. stop | 8. health |
| 4. wasting | 9. will |
| 5. long | 10. people |

ACTIVITY 3, Page 70

- | | | |
|-----------------|--------------|-----------------|
| 1. scale | 6. provide | 11. unnecessary |
| 2. conservation | 7. shopping | 12. packaging |
| 3. highways | 8. areas | 13. produce |
| 4. mass | 9. distance | 14. solid |
| 5. systems | 10. gasoline | 15. fuel |

USING LEGIBLE CURSIVE HANDWRITING

ACTIVITIES 1 - 4, Pages 71, 72, and 73

NOTE: Student will copy assignments and evaluate the handwriting.

PUNCTUATION

ACTIVITY 1, Page 74

1. (.)
2. (.)
3. (?)
4. (.)
5. (?)
6. (.)

ACTIVITY 3, Page 75

1. let's
2. don't
3. we'll
4. I'm, we've
5. isn't, we'll

ACTIVITY 5, Page 76

1. , Dr. Bogan
2. Jill,
3. , Jill,
4. Bill,
5. Dr. LaHart,

ACTIVITY 2, Page 74

1. Mrs.
2. Mr.
3. Dr.
4. Gov.
5. Col.; U.S.

ACTIVITY 4, Page 75

1. B
2. A
3. A
4. B

ACTIVITY 6, Page 76

1. D sun's
2. A women's
3. B Florida's
4. A state's
5. B children's

CAPITALIZATION

ACTIVITY 1, Page 77

1. Our; Democritus
2. He
3. Aristotle
4. In; Dalton
5. I, Pierre, Marie Curie
6. They
7. Dr., David

ACTIVITY 2, Page 78

1. C. Doctor
2. A. Denmark
3. B. New Mexico
4. C. September
5. A. Cairo

ACTIVITY 3, Page 79

1. C. January
2. B. Maryland
3. B. Post Office
4. B. Doctor
5. A. District of Columbia
6. A. Florida